DOCUMENT RESUME

ED 037 856 EC 005 247

AUTHOR	Sullivan, Richard A.; And Others
TITLE	Telephone Services for the Handicapped. Rehabilitation Monograph XXXVII.
INSTITUTION	New York Univ., N.Y. Medical Center.
SPONS AGENCY	American Telephone and Telegraph, New York, N.Y.
PUB DATE	68
NOTE	152p.
EDRS PRICE	EDRS Price MF-$0.75 HC-$7.70
DESCRIPTORS	Audio Equipment, Equipment Evaluation, Equipment Utilization, *Exceptional Child Services, *Physically Handicapped, Sensory Aids, *Telephone Communication Systems

ABSTRACT

A study by American Telephone and Telegraph investigated the use of standard Bell equipment in meeting the needs of the disabled for telephone service. Results revealed that all disabled persons who are able to communicate orally can initiate and terminate a call and carry on a conversation when the correct types of equipment are found, especially when push button dials are universally available or when an operator is available. The monograph presents information on the difficulties encountered in using the phone and on equipment found useful. Each phone, headset, or modification is described through words and by photographs; advantages and disadvantages are noted. Several factors influencing the choice of telephone equipment (answering in time, access, and family use) are considered. Evaluation of the patient and the equipment is discussed in regard to the amount of physical function present and the testing and matching of equipment for various disabilities. Choice of telephone, assistive devices, special services for summoning aid, use of the phone for home business, and coin phones for wheelchair users are also mentioned. (RJ)

ED037856

EC05247E

REHABILITATION MONOGRAPH XXXVII

Telephone Services for the Handicapped

Richard A. Sullivan, M.D.
Fred H. Frieden, M.D.
Joy Cordery, M.A.O.T., O.T.R.

Institute of Rehabilitation Medicine
New York University Medical Center

400 East 34th Street
New York, New York 10016
1968

ERRATUM

Please insert the following correction on page 39

Operation.

Rotary Dial

A 9-type dial, inclined at an angle of 15° from the horizontal, taking 2 to 6 oz. to move.

Touch-Tone Dial

See Touch-Tone dial. Inclination from the horizontal, 15°, taking 6 to 10 oz. to move.

Please insert the following caption on p. 31

Lightweight headset. Right—headset attached to headband. Below right—acoustic coupler. Center top—clip-on amplifier. Left—earplugs in different sizes.

ED037856

REHABILITATION MONOGRAPH XXXVII

Telephone Services for the Handicapped

Richard A. Sullivan, M.D.
Fred H. Frieden, M.D.
Joy Cordery, M.A.O.T., O.T.R.

U.S. DEPARTMENT OF HEALTH, EDUCATION & WELFARE
OFFICE OF EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL OFFICE OF EDUCATION POSITION OR POLICY.

This publication is a result of a
two-year study sponsored and supported by the
American Telephone and Telegraph Company.

Institute of Rehabilitation Medicine
New York University Medical Center
400 East 34th Street
New York, New York 10016
1968

Table of Contents

Foreword

–by Howard A. Rusk, M.D. 5

Introduction

–The study and its results 6
–The local Telephone Company 7
–Establishing telephone evaluations in a rehabilitation facility 8
–Some definitions of Terms 8
–Organization of the monograph 9

1) The difficulties encountered by the disabled person in using a telephone 10

2) Telephone equipment found useful for the physically disabled 13
Telephone sets 15
Equipment for conversation 28
Dials and dialing arrangements 38
Telephones for special situations 47
Equipment drawings 51

3) General factors influencing the choice of telephone equipment 58
Reaching the telephone 58
Use of the telephone by the family 59
Arrangement of the work area and sequence of actions 60
Use of the telephone at place of work 65

4) Introduction to the evaluation of the patient: equipment analyses 67
Analysis 1) Using the handset 67
–Loss of joint range of motion 69
–Loss of coordination 69
–Loss of muscle strength 69
Weights of handsets 69
Analysis 2) Using switches 71
Methods of making contact with a switch 71
Characteristics of switches 74
Analysis 3) Dialing 75
A) Touch-Tone dial 75
B) Rotary dial 75
Comparison of Touch-Tone and rotary dialing 76
Time available for dialing 77
C) Repertory dialers 77
D) Manual service and "one-number" dialer 77

5) Evaluation of the patient:
Phase One—Physical Function 79

6) Evaluation of the patient:
Phase Two—Equipment Tests 84
The order of testing the equipment 85
Testing equipment for conversation and choosing a telephone set: 85
Handsets 85
"Hands-free" equipment 85
Testing dials: 86
Touch-Tone dial 86
Methods of contacting the dial 86
Procedure for testing the Touch-Tone dial 88
Rotary dial 90

Designation of terms for the position of hand and dial 90
Methods of contacting the rotary dial 94
Procedure for testing the rotary dial 102
Procedure for testing the Card Dialer 105
–Neuromuscular incoordination 105
–Difficulty in recognition of numbers 106
–Identification of cards 107
–Perceptual deficit 107

7) Selected diagnoses and disabilities 109

Amputation of the upper extremity 109
Aphasia 111
Blindness 111
Deafness 112
Neuromuscular incoordination 112
Muscular dystrophy 113
"The One-Handed" 113
Parkinson's disease 115
"The Person without Arm Function" 115
–The order of testing 115
–Microswitches 116
–Positions for standard switches and microswitches 116
–"The patient with slight motion in the arms or other parts of the body" 118
–"The patient with good motion of the trunk" 118
–"The patient with motion only at head and neck" 120
Rheumatoid arthritis 123
Spinal cord quadriplegia 124

8) The final choice of telephone 124

9) Assistive equipment and its significance for use of the telephone 125
Wheelchairs 125
Assistive equipment for the upper extremity: 127
–Balanced forearm orthosis 127
–Overhead suspension sling support 127
–Elbow flexion orthosis 127
–Wrist and hand orthoses 127
Self-help devices: 128
–Writing cuff 128
–Mouthstick 128
Equipment for respiration: 129
–Rocking bed 129
–Tank respirator 130
–Chest shell 130
–Positive pressure equipment 130

10) Special facilities or services for summoning assistance 131

11) The use of the telephone for a business at home 132

12) Coin telephones for the wheelchair user 135

Appendices:

A) The diagnostic and disability categories of the 305 patients evaluated during the study 140
B) Functional analysis of using the handset 141
C) Functional analysis of using a paralyzed hand in rotary dialing 143
D) Telephone equipment for patient evaluation 145
E) Rates for standard telephone equipment. 147

Illustrations

Figure

1 The assistance that suitable telephone equipment can provide to the severely disable person. 11, 12
Telephone equipment found suitable for the motion handicapped. 13-51
Equipment drawings. 52-56
2 Mr. and Mrs. V. Use of the telephone by the family. 61
3 Mr. G. H. Arrangement of the work area. 63
4 Mr. G. H. Arrangement of the work area. 64
5 Mr. J. S. Use of the telephone at place of work. 65
6 Holding a standard handset. 68
7 Using the Wear-it-and-Hold-it set as handset. 71
8 The patient with loss of joint range of motion. 71, 72
9 Positioning the modified 6017-type key. 73
10 Lines of force in using the rotary dial (diagrammatic). 76
11 Methods of contacting the Touch-Tone dial. 87
12 Height and inclination of the Touch-Tone dial. 89
13 Rotation of the Touch-Tone dial. 91
14 Designation of terms for the position of the arm and dial. 92
15 Axes around which a dial is rotated. 93
16 Rotating the rotary dial completely around. 94
17 "Ball" dialing tool: Methods of holding it in the hand. 95
18 Use of a "grooved knob" dialing tool. 96
19 "Ball" dialing tool: in a cuff across the palm and the corresponding positions of the dial. 97
20 Dialing tools in the spring clip of ADL long opponens orthosis. 98
21 Using the thumb to dial. 98
22 Using the palm of the hand to dial 99
23 Special method of dialing when the arm has function but the fingers are paralyzed. 99
24 Special method of dialing when the arm has function but the fingers are paralyzed. 101
25 Positioning a dial according to the dialer line. 102
26 Positioning the rotary dial for distance. 104
27 Adjustment in rotation of the dial. 105
28 The Above-Elbow Amputee. 111
29 Blindness. 112
30 Deafness. 112
31 The One-Handed. 114
32 Parkinson's Disease. 115
33 Mountings for microswitches. 117
34 "The patient with slight motion in the arms and other parts of the body." 119

35 "The patient with good trunk motion." 120
36 "The patient with motion only at neck and head." 121
37 "The patient with motion only at head and neck." 121
38 Rheumatoid Arthritis. 122
39 Modified 4A key equipment for use in a tank respirator. 129
40 Coin Telephones — 200 Series and 1A1. 136
41 Approaching a wall mounted telephone. 137
42 Use of a stick for inserting money. 138

Foreword

The importance of a telephone to a disabled person cannot be overestimated. It can enable him to work, it can allow the homebound to reach out to friends and the community, it can provide a measure of safety to those who live alone.

This Monograph provides a method of evaluating the functional motions of the disabled person and of correlating these abilities with the physical requirements for operating the different items of telephone equipment. It provides comparisons between the operating features of the equipment and offers guidelines by which one item may be judged more appropriate than another. It gives examples of the general factors of social and vocational use that influence the disabled person's choice of equipment and discusses the significance of the patient's diagnosis or disability, his use of assistive equipment, and his need for special services.

The Rehabilitation Monograph is a companion to a Manual on Telephone Services for the Motion Handicapped that has been distributed throughout the Bell Telephone System. They differ only in approach: the Rehabilitation Monograph is directed to those concerned with the rehabilitation of patients during their association with a treatment facility; the Bell Manual is directed to Telephone Company personnel who are concerned with providing telephone service to their customers at home or at work.

The information for the two publications resulted from a two-year cooperative study conducted at the Institute of Rehabilitation Medicine under the sponsorship of the American Telephone and Telegraph Company. The depth and scope of the study would not have been possible without the interest and awareness of AT&T of the problems of the handicapped and without their willingness to give support. In addition to providing consultation and technical assistance to the study, they have strengthened existing policies throughout the Bell Telephone System to insure that as far as possible the need for telephone service of any disabled person can be met.

AT&T is to be commended for their sensitive understanding of the problem and their generosity in providing the assistance that made this Monograph possible.

HOWARD A. RUSK, M.D.

Introduction

The Study and Its Results

In 1965, representatives of the American Telephone and Telegraph Company approached the Institute of Rehabilitation Medicine to discuss the problems of providing adequate and efficient telephone service for customers who were disabled by motion handicaps. These discussions led to the sponsorship by AT&T of a two-year cooperative study into telephone services for the physically disabled.

Purpose of the Study.

The purpose of the study was to investigate the use of standard Bell System equipment in meeting the needs of the disabled for telephone service. The equipment was to be tested to determine which items could be used in the normal manner, which equipment could be used when simple modifications were made, and whether there were requirements that could be filled only by the development of new equipment.

Equipment and disability were to be matched. The types of disability were to be classified into broad categories, and the special needs for telephone service of the individuals so handicapped were to be outlined.

The results were to be published in two Information Manuals: the first, for the Bell Telephone System, to allow the Bell Representative to meet the telephone needs of the handicapped customer; and the second, a Rehabilitation Monograph published by the Institute of Rehabilitation Medicine, to provide information for medically oriented personnel in meeting the vocational and social needs for telephone service of patients and clients.

Method and Scope of the Study.

Three hundred and five patients* representing the full range of diagnostic categories that result in upper extremity disabilities, from the Institute, the Goldwater Memorial Hospital, and the community, were tested extensively. The homes and places of work of several disabled persons were visited.

Each patient was evaluated in detail for his residual functional motion, his performance using the different items of equipment, and for his vocational and social needs for telephone service. In addition, the techniques that he had developed to use the telephone despite his handicap were analyzed and recorded.

Each item of equipment was analyzed for its physical requirements for normal operation. This information was correlated with the data from the evaluation of functional motion and performance of the patients. This in turn enabled some criteria

*See Appendix A.

to be established whereby equipment could be matched to the abilities and needs of an individual disabled person.

Results of the Study.

Upon completion of the study the following general conclusions could be reached:

1) It is technically possible to provide telephone service for all persons disabled by neuro-muscular-skeletal disorders who are able to communicate orally.

2) Standard Bell System equipment was found to have potential for meeting the needs of all but a few. The exceptions lay in the unusual and special needs of some persons who, while able to use a telephone, desired further refinements in the service it provided. If cost had not been a factor, these requirements could have been met.

The study disclosed that "standard" equipment could be used in four distinct ways:

—In the normal manner, as in the case of the Speakerphone (a telephone with loudspeaker and transmitter) that aids the person who can use only one hand.

—In an unconventional way, such as turning the telephone set completely around for easier dialing.

—With minor modifications, such as a lever placed over a pinch-operated turnbutton switch.

—For a purpose other than that for which it was designed, such as using a line button for an "on-off" switch in order to leave the receiver permanently off the switchhook.

3) The ability to use a telephone independently depended to a large extent on the use of equipment appropriate to the patient's physical function, but the technique he employed to operate the equipment was found to be of equal importance.

4) The study developed information about the equipment, such as its weight, shape, and operating pressures, that should be helpful in the design of future equipment for normal use or use by disabled persons.

5) Devices to hold a receiver to the ear proved necessary for some disabled persons. Since these items were not available through the Bell System, the study evaluated two holding arms obtained from commercial sources. (Only two were included because no others were known to be available.)

6) While it was possible to classify the types of disability into broad categories, there was little correlation between diagnostic categories and the types of equipment found useful for any one person within each group. The variation in physical function—even among several persons with the same diagnosis—showed that each person must be evaluated individually for his need for telephone equipment.

7) Some general statements are possible:

All disabled persons who are able to communicate orally can initiate and terminate a call and carry on a telephone conversation when the correct types of equipment are found. All those who can grasp and hold a receiver have the potential ability to use a dial, with the exception of those who have visual perceptual problems or who have some types of neuromuscular incoordination.

The great majority of severely disabled persons will be able to dial without assistance when the pushbutton dial (Touch-Tone calling) becomes more universally available.

Using a rotary dial successfully requires muscle strength in the arm (or trunk and neck), equipment offering little resistance, the employment of the appropriate technique, and the development of skill. A smaller proportion of severely disabled persons are able to use a rotary dial.

Of those unable to use any form of dial due to severe losses in physical function, all may make calls in areas where the assistance of the telephone operator can be made available.

8) The publication of the two manuals—a Bell System Manual and a Rehabilitation Monograph—provides information that allows the needs of disabled persons for telephone services to be evaluated and met, both in the community and in medical and training facilities.

The Local Telephone Company

There are several telephone systems in the United States and Canada, of which the largest is the Bell System. The Bell System comprises 23 operating companies, subsidiaries of, or associated with, the American Telephone and Telegraph Company. Operating practices vary among the Bell Companies. Interstate communication is regulated by the Federal Communications Commission, whereas the rates charged for telephone equipment and service within a state are subject to the jurisdiction of the Regulatory Commission of that state. These rates and policies, therefore, will differ from one locality to another.

The study at the Institute of Rehabilitation Medicine was sponsored by AT&T, and the Monograph is based on the equipment and practices of the Bell System. Its contents would not be relevant to those areas of the country served by other telephone companies, except that the Bell Manual on Telephone Services for the Motion Handicapped is available through the Bell System to all Telephone Companies.

All Telephone Companies have departments of Marketing and Engineering. The Marketing department is concerned with providing service to customers and the Engineering department is concerned with the technical aspects of equipment for the system.

Each Bell Telephone Company has a Marketing Coordinator of Services for the Handicapped and an Engineering Coordinator of Services for the Handicapped. Personnel of a rehabilitation facility in which the evaluation of patients for their telephone needs is being considered, should call the local Telephone Business Office and ask for the Marketing Coordinator of Services for the Handicapped to contact them. In particular, this contact should always be made if there is any difficulty in meeting the needs of an individual patient. The personnel of the Telephone Company will attempt to devise a special arrangement in any case where equipment outlined in the Monograph is not sufficient.

Establishing Telephone Evaluations In a Rehabilitation Facility

Disabled persons in the community can call the Bell Telephone Company to request a visit by a representative to determine their needs for a telephone and to provide them with an opportunity to test the equipment. Therapists, counsellors, or others in a rehabilitation facility that only infrequently has patients who need a special telephone can also request such a visit to evaluate a patient at their center.

The rehabilitation center whose volume of patients requiring telephone evaluations is sufficiently great may wish to obtain telephone equipment by which patients can be tested while undergoing treatment.

AT&T has recommended to the Bell Operating Companies that they consider providing appropriate telephone equipment on consignment to rehabilitation facilities whose amount of use will justify this. The policy of the local Telephone Company regarding this may be found by contacting the Marketing Coordinator.

In order to make full use of any telephone equipment, certain physical facilities for the area in which testing is to be carried out are necessary. Telephone equipment is valuable and storage space that can be locked is essential. The equipment that is needed includes a stable adjustable-height table that allows unhindered access to its surface, an electrical outlet, and a telephone wall jack. A wall jack, while not essential, is highly desirable in order that the patient can test the equipment realistically. This can be important in using the volume control handsets, the headsets, and Speakerphone, and in testing whether the patient can complete dialing in the time available. Several ways of obtaining a realistic use of the telephone are possible, the most desirable of which is to have an extension number through the hospital switchboard. However, if all the calls must go through an operator, or for other reasons a line through the switchboard is not practicable, two other methods can be considered. A private telephone line can be installed and paid for by the hospital or, under certain circumstances, a room circuit that does not connect into the telephone lines may be installed. These alternatives may be discussed with the Marketing Coordinator.

Some Definitions of Terms

Every field has its own language and the telephone industry is no exception. The terminology of the Monograph is one used in the Bell System. Even so, there are many variations in current usage among the Bell Companies and the terminology here—identical with that used in the Bell Manual—represents a definite choice from the many terms in use. (For example, the "Wear-it-or-Hold-it set" is also variously known as "53A-type headset," or a "combination headset".) While all equipment has identifying numbers, these need only be used when the name alone does not provide sufficient identification. Numbers are given next to such names in Chapter 2, where the telephone equipment is fully described.

Generally, the terms used are clear and understandable in context, but the following explanations may be helpful.

Handset. "Handset" is used to denote the ordinary telephone "receiver" held in the hand—as opposed to a "headset" that is worn on the head. Because a receiver is the part through which the user listens, and there is a transmitter to send his speech, a handset cannot correctly be called a "receiver." This becomes obvious if an attempt is made to call a weak speech handset—where the user's voice is amplified—a "weak speech receiver."

Standard Handset. This refers to any handset provided as the standard one on a telephone, as contrasted with, for example, a volume control handset (p. 34) or the Wear-it-or-Hold-it handset (p. 28).

Equipment for Conversation. This term is not one used by the telephone industry but has been chosen to define a category that covers all equipment over which a conversation is held, i.e., the handsets, headsets, or the loudspeaker and transmitter of the Speakerphone.

Switchhook. These are the buttons on the telephone cradle that connect and disconnect the telephone when the handset is lifted and replaced.

Externally Mounted. This term is used when referring to an item of equipment that, while performing one of the functions of a telephone, is not integral with a telephone set. For example, the separately housed dials (p. 39) could also be called externally mounted.

Key. A key is a switch. It may take different forms: A "6017-type key" (p. 24) is a flat rectangular box with a toggle lever at one end that may be used in association with a telephone to switch it on and off. A "6050-key" (p. 28) is a rectangular box containing six pushbuttons that serve the same function as the six buttons on an office telephone. It is an "externally mounted unit."

Jack. A socket into which a plug fits. It may be a "wall jack," into which a telephone is plugged, or a "headset jack" on a telephone, into which the cord for a headset is plugged.

Mounting Cord. The cord connecting the telephone to the terminal block on the wall.

Handset Cord. The cord that connects the handset to the telephone.

Special Assembly. This term is used in the Bell System to describe the combination of several standard pieces of equipment used together in a non-standard manner, or in referring to equipment that has been modified. It is most frequently used to refer to equipment which has been individually designed to fulfill a special purpose. Use of the term "special assembly" in the Monograph indicates that the item may be available through the Telephone Company.

Commercially available. This term indicates that the equipment may be obtained through sources other than the Telephone Company.

Not commercially available. The use of this term indicates that the equipment must be made for the patient by a local resource.

Organization of the Monograph

The telephone is used so routinely in daily life that it is usually taken for granted. The mechanics of its operation or the variety of instruments available are unknown to the majority of users. Although there are many items of equipment, the *operation* of any telephone can be reduced to three functions: connecting and disconnecting the call, using the equipment for conversation, and dialing. The choice that is offered by the variety of equipment lies in the different *methods* available to the patient in performing these three functions. For example, if he cannot lift a receiver, he can use a loudspeaker and transmitter, or perhaps a headset. If he cannot exert pressure on a pushbutton switch, he can choose to connect and disconnect a call by a lever.

The chapter on "Telephone Equipment Found Suitable for Use by the Physically Disabled," p. 13, provides a full description of the equipment that is available. Because such descriptions are not sufficient in themselves to enable a disabled person to select a telephone, an Evaluation Procedure is provided. It is divided into two phases: Phase One (p. 79) is an evaluation of the functional abilities of the patient and a general inquiry into the circumstances in which he wishes to use a telephone. Phase Two (p. 84) is concerned with the patient's test of the equipment and allows him the opportunity to use and compare the different items. He does not test all the equipment but only that which the preceding evaluation of Phase One has indicated he could use.

In order that Phase One can indicate this, "Introduction to the Evaluation of the Patient: Equipment Analyses," p. 67, analyzes the operation of the equipment and indicates the function that the patient must possess to use the different items. These instructions should be consulted before using the Evaluation Procedures.

Some disabilities exhibit features that are unique and, in some cases, have specific requirements for a telephone. The chapter on "Selected Diagnoses and Disabilities," p. 109, is provided as an adjunct to the Evaluation Procedures.

The type of assistive equipment used by the patient has a bearing on his use of the telephone, and a chapter is devoted to an analysis of "Assistive Equipment and its Significance for Use of the Telephone," p. 125.

The physical ability of a disabled person to operate a telephone is only one aspect of the process of selection. There are general factors of his use that must be taken into account. These are discussed in the chapter "General Factors that Influence the Choice of Telephone Equipment," p. 58.

Other chapters deal with the telephones used in summoning assistance, the use of a telephone for a business at home, and coin telephones for the wheelchair user.

Most disabled persons will have attempted to use a telephone. Some will have found that they have difficulty only with some aspects, such as dialing, whereas others, more severely disabled, will have been unable to use a telephone without the aid of another person.

The testing procedures in the manual are designed for use with the severely disabled person—who will need a thorough and comprehensive evaluation. Others, who are less severely involved, may specify the kind of improvement they are seeking and can be accommodated more quickly. In some cases, these patients may look at the illustrations and choose which items of equipment they wish to test. Nevertheless, it is suggested that the entire manual be read so that the evaluator does not overlook an aspect of the situation of which the patient may not be aware.

1.

The Difficulties Encountered by the Disabled Person in Using a Telephone

Using The Handset

For the majority of disabled people, the most difficult aspect of telephoning is using the handset, because it involves lifting weight. Those whose hands are paralyzed have difficulty in grasping the handle, and those whose shoulders and elbows are affected may not be able to lift it up to the ear. The difference in weight between the G1 standard handset and the G3 handset is only 2½ ounces, but this may be sufficient to make the G1 handset tiring to use. The difference between the G3 handset and the Wear-it-or-Hold-it handset (p. 30) can be even more significant: the lighter weight of the Wear-it-or-Hold-it set permits use of a handset by some who previously considered themselves unable to do so.

The person with a serious loss of arm function may not be able to use a handset himself and often relies on someone else to hold it for him. He will be greatly benefited by "hands-free" equipment (p. 85) for use in telephone conversation.

Connecting and Disconnecting

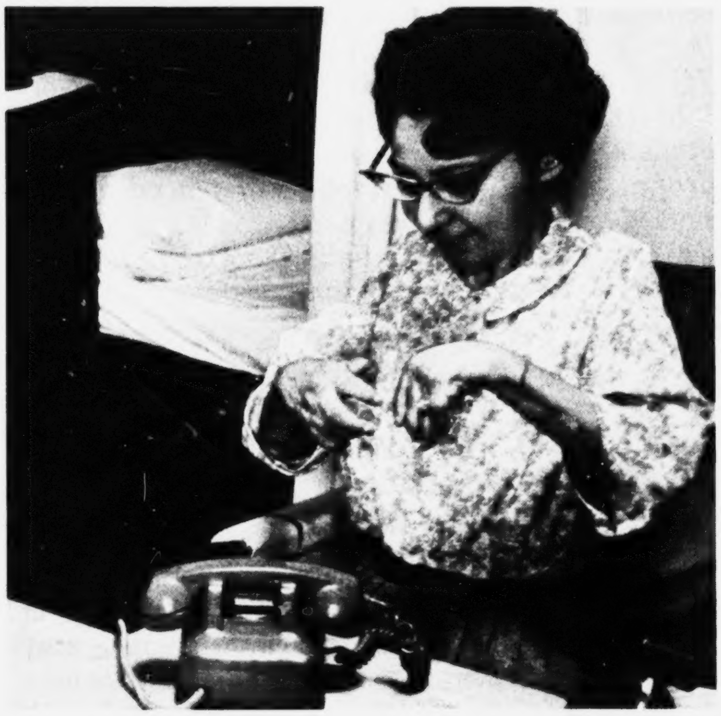
The person who cannot lift a handset to his ear may have it supported on a handset-holding device (p. 35). Since the switchhook buttons are not used, another method of disconnecting the circuit is needed. One way of allowing the handset to remain permanently off the cradle is by using a two-line telephone (p. 16) or a 6-button set (p. 17), and by operating the line button as an "on-off" switch. But if his fingers are paralyzed, the disabled person will not be able to grasp a turnbutton and if his arm is weak, he may not be able to exert the force of up to 2½ pounds needed for depressing the pushbutton.

A turnbutton may be modified, however, by adding a special assembly lever over it. Since no strength in the fingers will be necessary, all disabled people who can reach the lever can use this device.

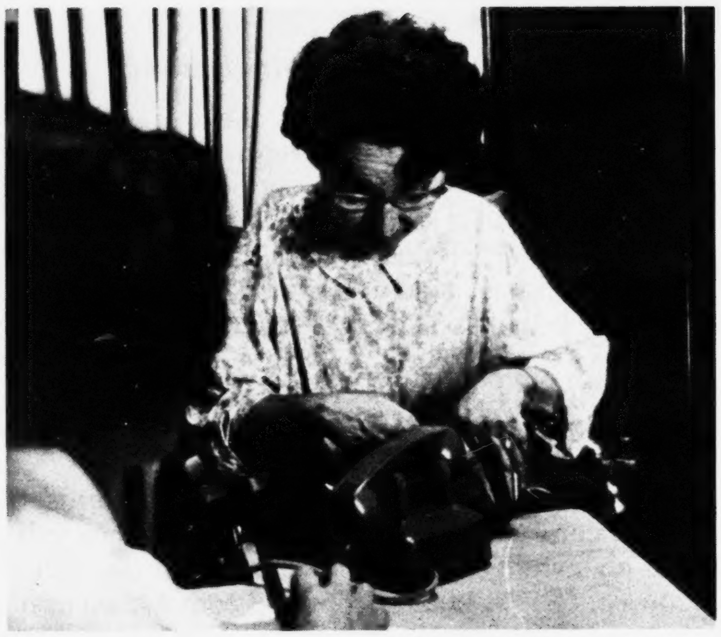
Dialing

Dials vary in the pressure needed to move them. When the disabled person's arm is seriously affected, the difference of a few ounces in resistance between the 7-type and 9-type rotary dials (p. 39) can be sufficient to prevent the use of the harder-to-turn 7-type. The person with paralyzed fingers may not be able to place a finger in the hole of the dial finger-wheel, and he may have difficulty using Touch-Tone buttons (p. 38). Nonetheless, a dialing tool may allow him to operate them, and if he cannot hold the tool, it may be secured to his hand by a universal cuff (p. 47).

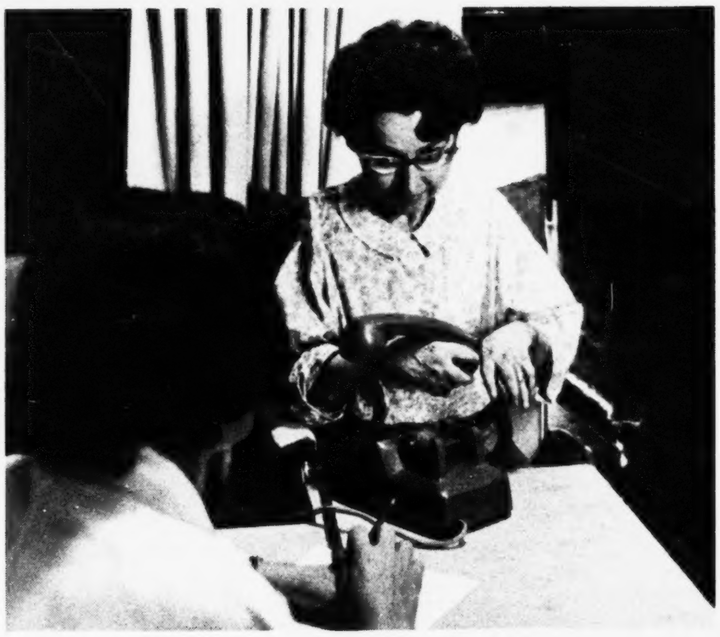
The person with ataxia or spasticity finds that attempting to dial the seven digits of a telephone number on a rotary dial aggravates his loss of control. Such a reaction may not always occur when pushing a button, and by using a Touch-



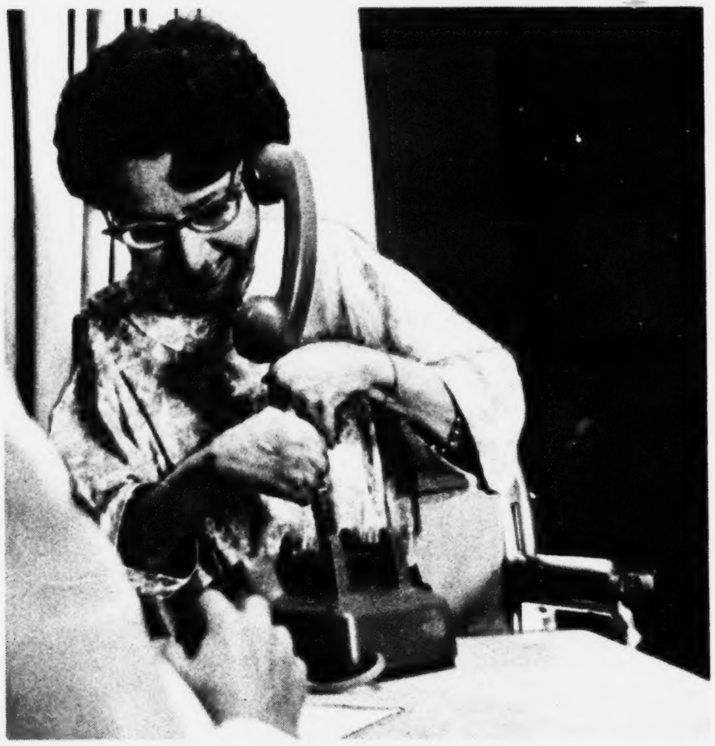
1a



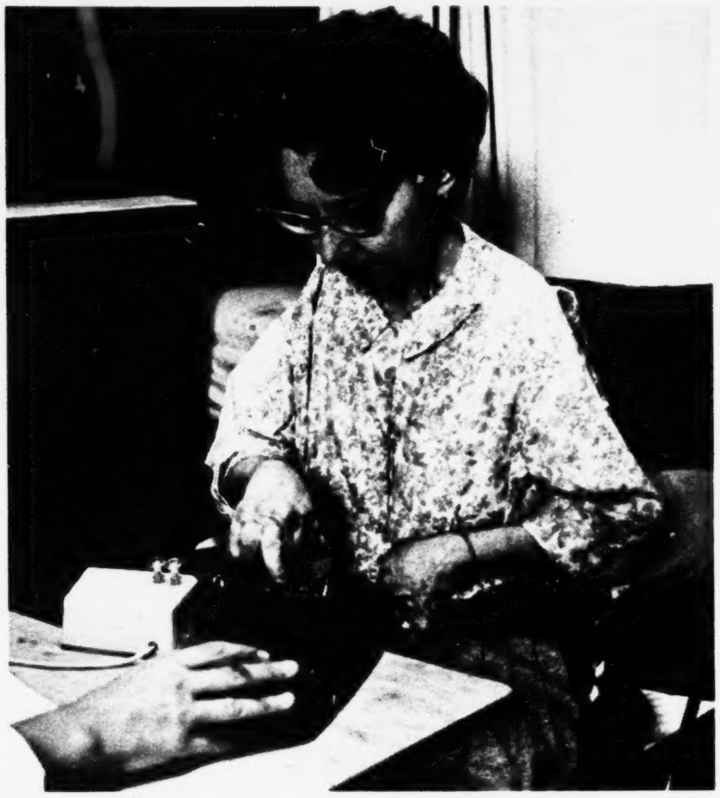
1b



1c



1d

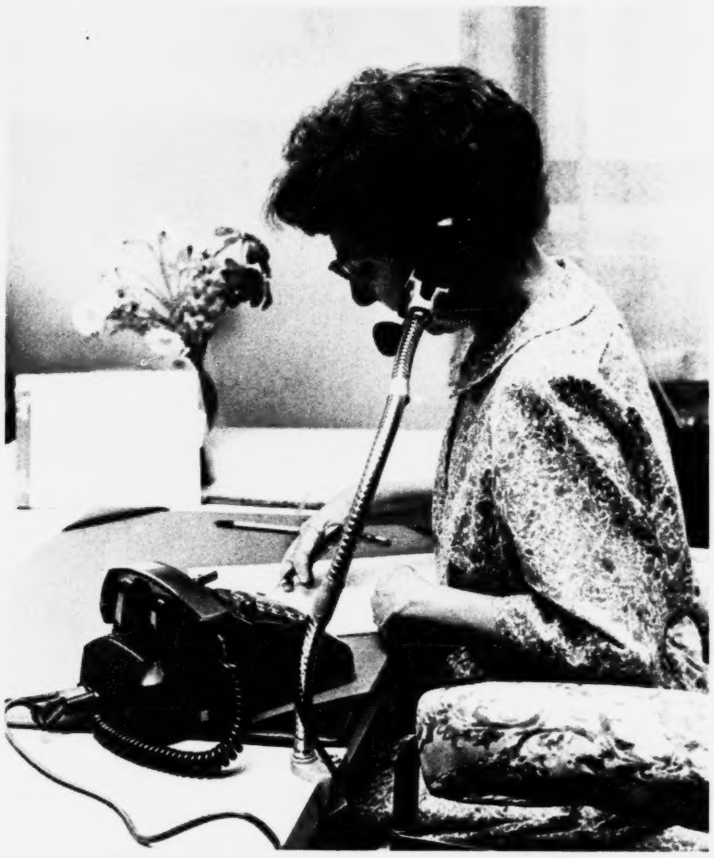


1e

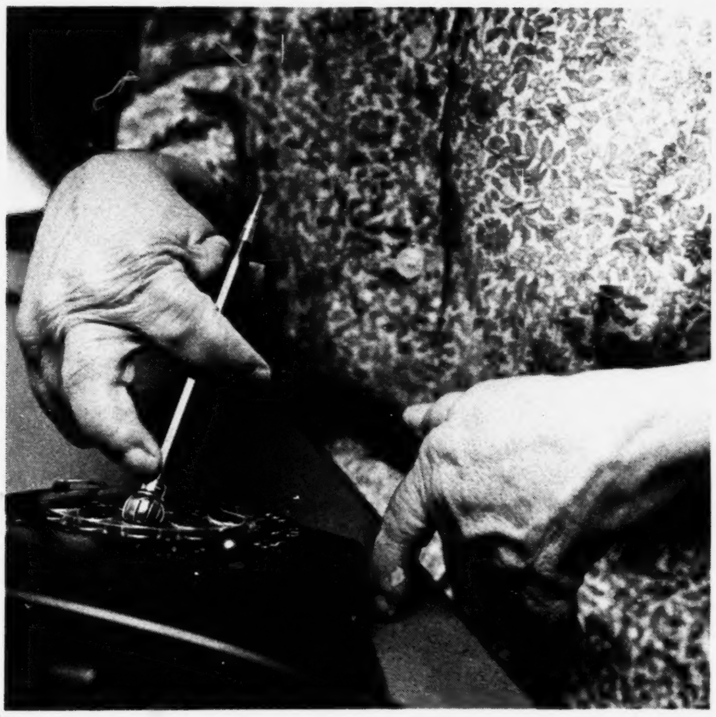
FIGURE 1 (a-g)

The assistance that suitable telephone equipment can provide to the severely disabled person.

Miss S., with a 25-year history of rheumatoid arthritis, was asked to show
(1a) range of motion of her elbows and shoulders,
(1b, c, d) the way in which she used a handset, and
(1e) how she dialed.
She lived in an institution for long-term care, worked part time in the Volunteers Office, and used the telephone frequently. Each call entailed effort and discomfort, much of which could be prevented by the use of suitable equipment. (cont.)



1f



1g

(continued)
The following improvements were suggested:
(1f) A handset-holding device with a Wear-it-or-Hold-it handset and a desk telephone with headset jack. A call was connected by the headset turnbutton and the ¾-inch lever placed over it allowed her to turn it easily.
(1g) The use of a "ball" dialing tool, to reduce the pain in her fingers when dialing.

Tone dial, such patients may be able to place their own calls.

Fatigue

Using a switch or dialing is performed intermittently, but a handset must be held for periods of time. A person who can lift a handset once may not find it possible to do so repeatedly, and he may find it too tiring to hold the handset for any length of time. His choice of handset or "hands-free" equipment will depend upon the amount of telephoning he must do.

Actions Concurrent With Telephoning

The person with the use of only one arm will have difficulty in taking notes, or referring to papers, while using the telephone. Many people place the handset on the shoulder and hold it there by pressure between ear, chin, and shoulder, but this is an uncomfortable position and may even be harmful. It will not be possible for the physically disabled whose necks are weak or painful. They will need the assistance of suitable telephone equipment.

Reaching The Telephone

The disabled person who is able to use a handset and dial can make a call, but his competence will be of no avail when he cannot reach the telephone (p. 58). A person confined to a wheelchair may have difficulty in using a telephone that has been installed for the person who walks about.

2.

Telephone Equipment Found Useful for the Physically Disabled

Telephone Sets

Desk telephones 15
Two-line desk telephone 16
6-button desk telephone 17
– hold-lever device 18
Wall telephones 18
Hanging hand telephone 19
Princess telephone 19
Trimline telephone 20
Speakerphone 21
– 6017 key 24
Desk telephones with headset jacks 25
4A key equipment 27
– 6050 key 28

Equipment for Conversation

Wear-it-or-Hold-it headset-handset 28
Comparison of standard handsets and Wear-it-or-Hold-it handset 30
Lightweight headset 31
Operator's headset 33
Volume control handsets 34
Handset-holding devices:
– Sparr telephone arm 35
– Luxo extension arm 36
– Shoulder rest 37
– Gooseneck arm with spring clamp 37

Dials and Dialing Arrangements

Touch-Tone dial 38
– device for calling operator 38
Rotary dials 39
Separately housed dials 39
Card Dialer 41
Magicall 43
Dialing tools:
–"Ball" dialer 44
– "Grooved-knob" dialer 46
– Universal cuff 47
– Coin and dialing sticks 47

Telephones for Special Situations

Automatic answering and recording sets 47
Call Director 47
Switchboards 47
Consoles 48
Equipment for the blind:
– 6-button telephone special assembly 48
– Seeing Aid 49
Equipment to compensate for deafness:
– Signaling devices 49
– Impaired hearing handset 49
– Bone conduction receiver 49
– Watchcase receiver 50
– Tactile-visual set 50
– Teletypewriter 50
– Telewriter 50
Equipment to compensate for impairment of the voice:
– Electronic larynx 51
– Weak speech handset 51
Services for the homebound student 51

Equipment Drawings

Extension levers 52
Extension toggle-lever 53
Paddle-lever device 54
Hold-lever device 55
Coin and dialing sticks 56
Notes on coin and dialing sticks 57

Telephone Sets

DESK TELEPHONE

Rotary Dial (500) *Touch-Tone Dial (1500)*

Description.

The basic desk telephone has a handhold at the rear of the housing, providing a ledge under which the fingers can hook for moving the telephone set. The standard handset (G3 being the lightest in weight—11½ oz.) rests across the switchhook buttons between the posts of the handset cradle.

The Touch-Tone dial can be supplied in areas offering the service. Many types of rotary dial are in use, of which the recommended 9-type takes the least effort to move (2 to 6 oz.).

Operation.

When the standard handset is lifted, the buttons of the switchhook rise and connect the circuit; replacement of the handset disconnects it. In flashing the operator, 2-lbs. pressure is required to depress the switchhook buttons.

Earlier Models.

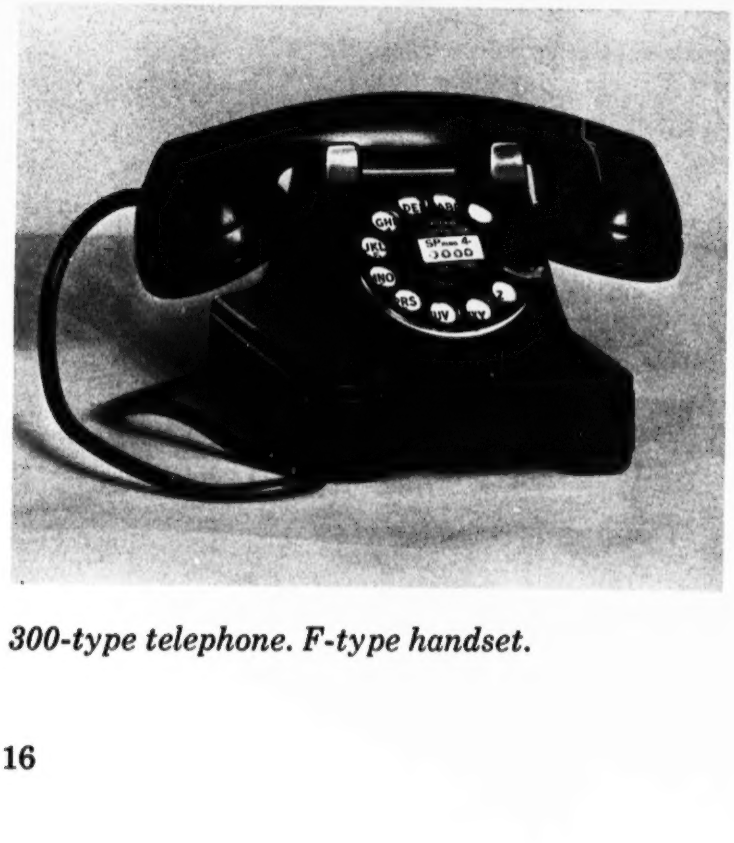
When investigating an existing installation, the model number may be found underneath on the base plate. Earlier models with numbers lower than 500 are still in service. Handsets marked F, or G1 (14 oz.) and G2 (13½ oz.) are heavier than the G3 (11½ oz.). The model number on the handle of the handset should be checked; some 500-type telephone sets have G1 or G2 handsets. The shape of the handles of the F Series handset is curved and not suited to use by a prosthetic hook or some types of hand orthoses.

The dials of these earlier models may be harder to turn than the 9-type available on later models. If a change in dial is necessary, a 500-series telephone should be installed. When the handset alone proves unsuitable, the G3 type may be substituted.

1500-type desk telephone. G3 handset.

500-type desk telephone. G3 handset. 9-type dial.

500-type telephone. G1, G2 or G3 handset.



300-type telephone. F-type handset.

TWO-LINE DESK TELEPHONE

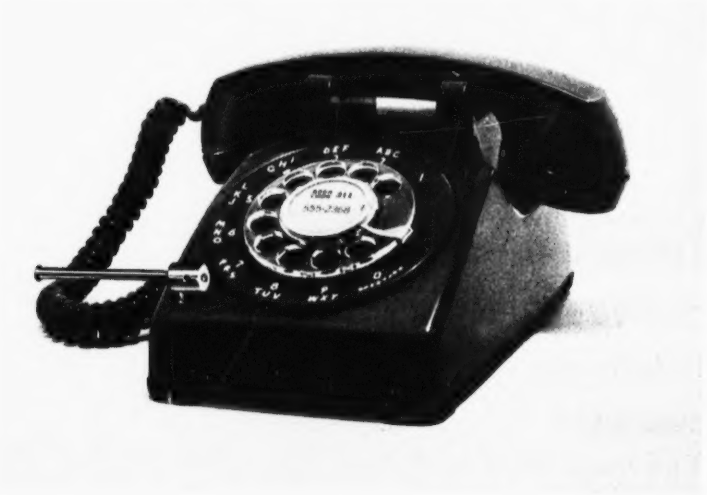
Rotary Dial (510) *Touch-Tone Dial (1510)*

Description.

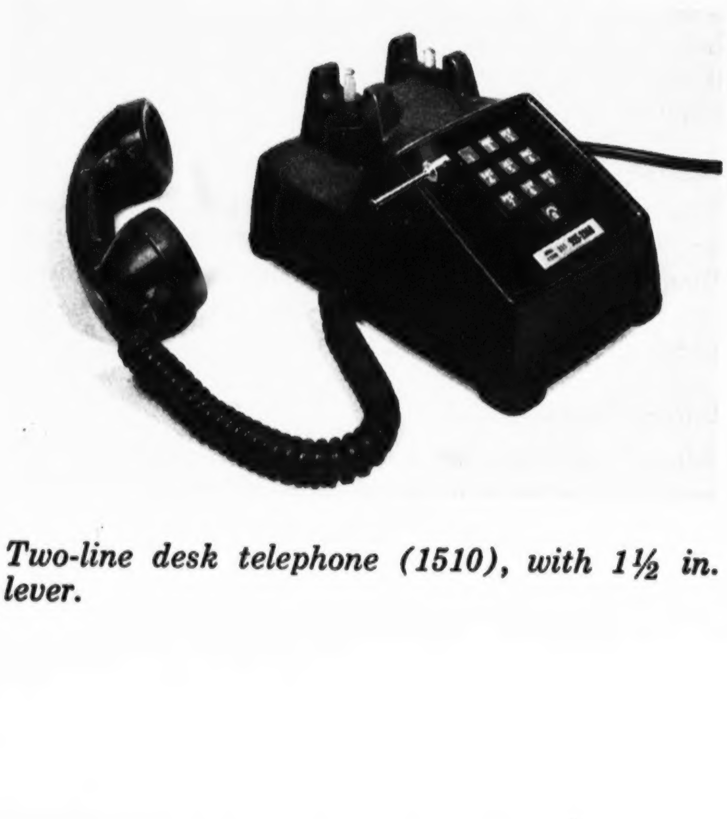
A desk telephone designed for use with two incoming lines. Either line is obtained by twisting the turnbutton to one of the two positions. Available with rotary or Touch-Tone dial. (See also two-line wall telephone.)

Operation.

When this telephone is equipped with only *one* incoming line, the turnbutton can be used as an "on-off" switch: One position of the two-line switch is equipped, and the other left unused to act as an "off" position. Fitting a 1½-in. (or 2½-in.) lever over the button allows its operation by horizontal movement through 90°, over a range of 2½-in. for the shorter lever, 3½-in. for the longer lever. The button is spring-assisted on its movement counterclockwise. The pressure in one direction is 2 oz. (or 1¼ oz.) Pressure in the other is ½ oz. (or ⅓ oz.). The choice of which position to equip for "on" may be determined by



Two-line desk telephone (510), with 2½-in. lever.



Two-line desk telephone (1510), with 1½ in. lever.

the disabled person's function. Also, the position taken when the lever is moved "on" should not interfere with his use of the dial.

Remarks.

When the handset is to remain off the cradle, the turnbutton on the two-line telephone, used as described above, can be employed as an "on-off" switch.

6-BUTTON DESK TELEPHONE

Rotary Dial (564) (Model HL)

Touch-Tone Dial (1564) (Model HL)

Description.

This 5-line telephone is customarily used in a business to terminate several lines and/or internal extensions, and has a button used for holding a call. The buttons may be round (Model HD) or square (Model HL). The square buttons have a larger area for pressure and are recommended. (Also available as 6-button set with headset jack.)

Operation.

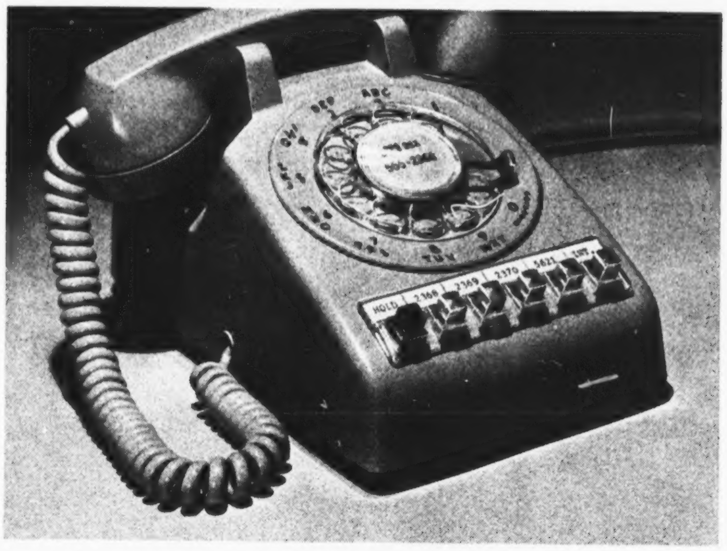
After the handset is lifted, it is necessary to depress a line button to connect the circuit. Pressure to operate a line button falls within a range of 9 oz. to 2 lbs. Pressure to operate the hold button ranges from 3 to 4 lbs.

To disconnect the call, either the handset is replaced or the button is released by partial depression of any of the other line buttons. When the person is unable to perform the controlled movement of partial depression, an unused line position may be utilised as an "off" switch.

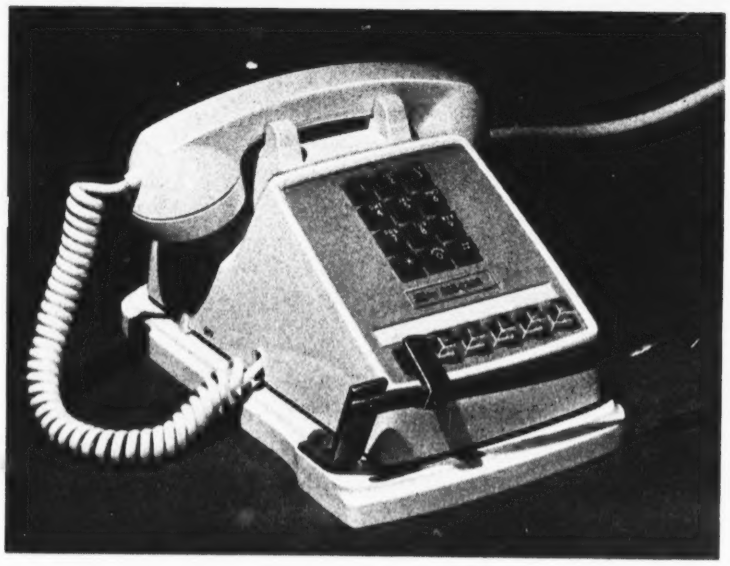
Supplemental Equipment.

When all five line positions are in use, a separately mounted unit may be added for the "off" switch.

541A jack and 504A plug. Normally the 6-button desk telephone has to remain in the position in which it has been installed, but a jack and plug to allow its transfer between wall jacks can be made available in some cases.



6-button desk telephone (564 HL).



6-button desk telephone (1564 HL), with special assembly hold-button lever.

Special Assembly.

Hold-button lever. When the disabled person can depress the line buttons, but is unable to depress the hold button, the force requested for the hold button may be reduced to that of the line buttons by means of a special assembly lever device.

Remarks.

When the handset is to remain off the switchhook, either in the home or in the office, the 6-button telephone, use as described above, can provide an "off" switch.

WALL TELEPHONES

Rotary Dial *Touch-Tone Dial*

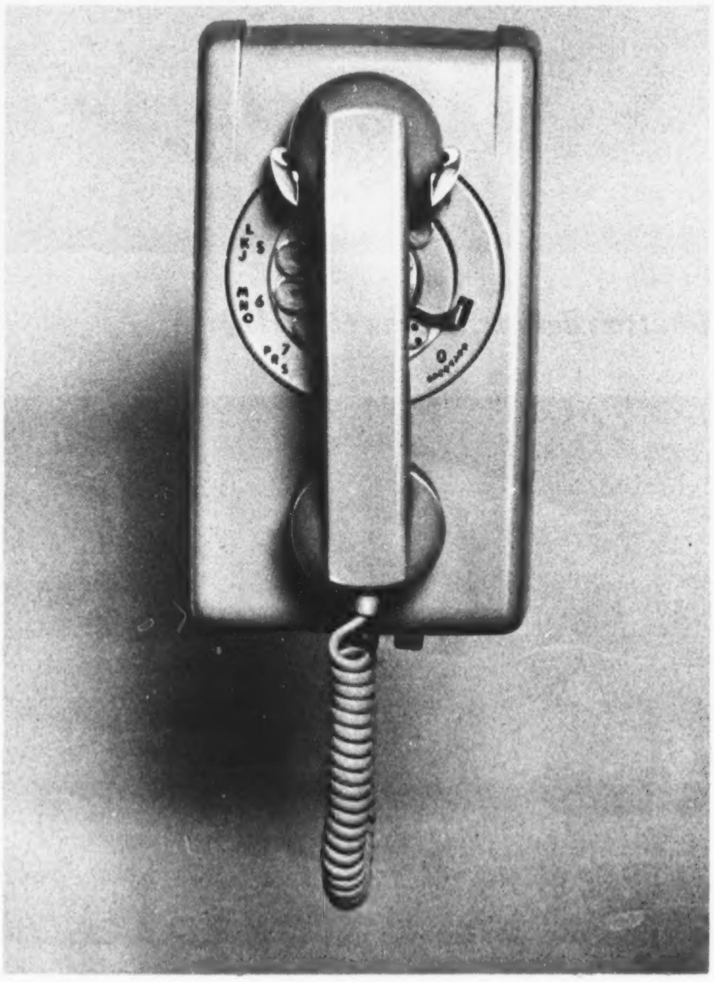
ROTARY DIAL WALL TELEPHONE

Description.

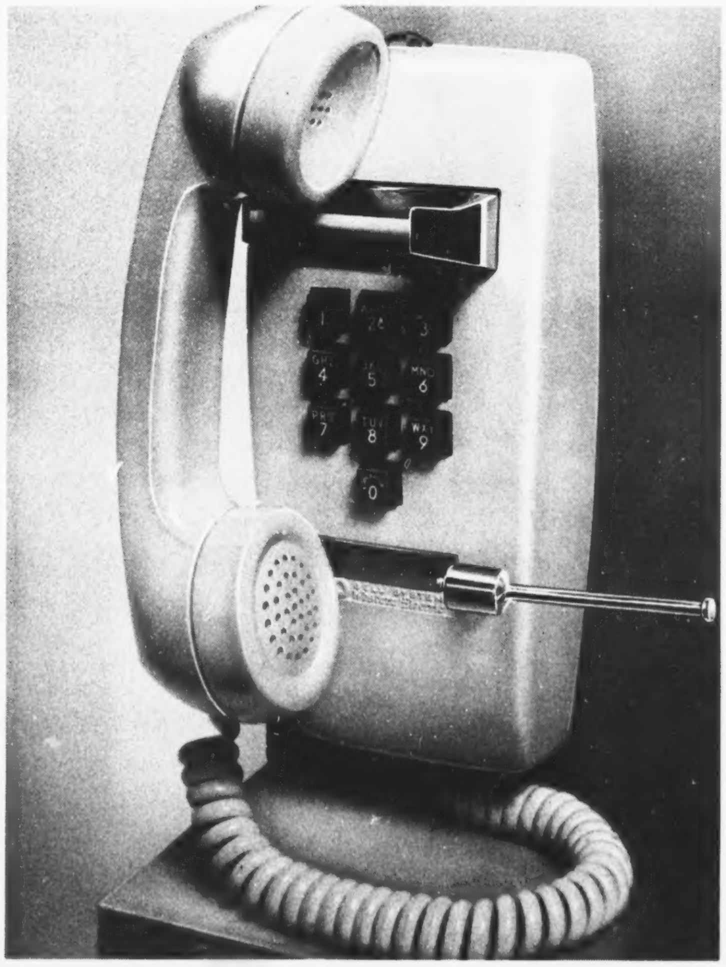
The handset hangs upright on a movable hanger (operating the switchhook) at the front of the telephone. The dial is mounted vertically. *It must be a 9-type dial.*

Operation.

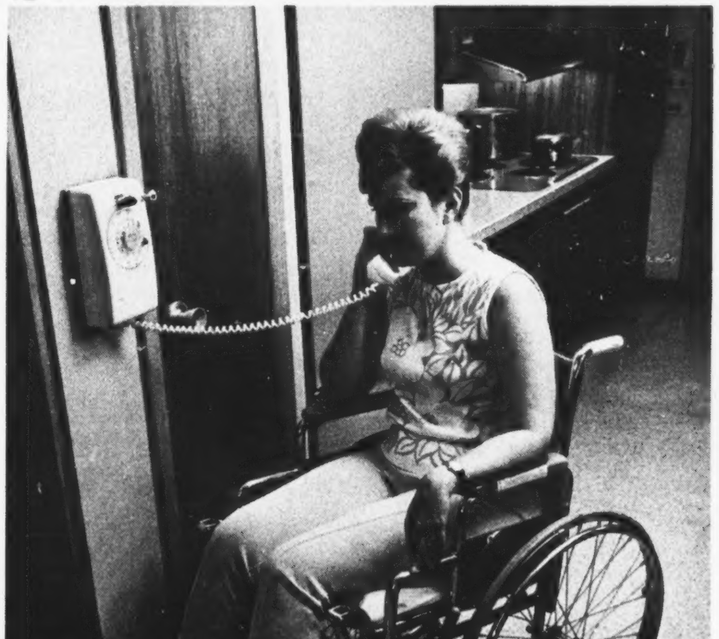
The handset hanger rises as the handset is removed, necessitating lifting the handset 1⅛ in.



Rotary dial wall telephone.



Two-line wall telephone with Touch-Tone dial. 2½-in. lever.



Wall telephone mounted at a height suitable for use from a wheelchair. (The user has normal arm function.)

upward. A groove on either side of the top of the housing allows the handset to be lodged there when the user temporarily leaves the telephone during a call.

TWO-LINE WALL TELEPHONE

Description.

Available with rotary or Touch-Tone dial. See two-line desk telephone.

Operation.

When the handset is to remain off the switchhook, the turnbutton, used as described for two-line desk telephone, can provide the "on-off" switch.

TOUCH-TONE WALL TELEPHONE

Description.

The handset hangs upright on a rigid hanger, holding down a lever switchhook. The Touch-Tone dial is mounted vertically.

Operation.

The handset needs lifting only ¼ in. to take it off the rigid handset hanger. The side or top of the hanger may be used for resting the handset.

Remarks.

A wall telephone can save space and allow good access for the wheelchair user with adequate arm function. It must be placed at the appropriate height on the wall and positioned to allow a clear space on either side as necessary. (When the wheelchair user has a loss of arm function and is unable to use the telephone from the front, he will do best when approaching diagonally or parallel to the wall, with the arm to be used reaching across his body, see p. 125). When the person has contractures of his hands and fingers, he may even need to back the chair diagonally to the wall so that his fingertip may be inserted in the hole of the dial finger-wheel.

Those lacking the ability to use a finger for dialing may use a dialer or pencil. The height for mounting the telephone is determined by finding the place at which the person can use the dial. (See p. 103.)

The Touch-Tone dial of a wall set is significantly easier to use than the rotary dial, because the latter, with its vertical position, is moved with the full effects of gravity acting against the user's arm.

HANGING HAND TELEPHONE

Rotary Dial (211)

Description.

A small telephone for mounting upright. Its attachment to a bracket allows it to face forward or to either side, and the upright slanted rotary dial can be adjusted to face around 360° at 30° intervals. The inclination of the dial adjusts in 15° increments from 45° to 90° from the horizontal. The standard handset hangs vertically on the handset hanger. Not available with Touch-Tone dial.

Hanging hand telephone.

Operation.

The handset hook rises as the handset is lifted, requiring an initial vertical movement of 1⅛ in. before removing the handset. The dial is relatively stiff and takes up to 8 oz. pressure to move.

Supplemental Equipment.

Externally mounted 6-button unit (6050 key, p. 28).

Remarks.

The mounting allows the telephone to be fastened on the leg of a desk or on a wall so as to leave the top of a desk or table free for working space. Good arm and hand function is required.

PRINCESS® TELEPHONE

Rotary Dial *Touch-Tone Dial*

Description.

A small desk telephone. The handset rests across

Princess telephone with rotary dial.

Princess telephone with Touch-Tone dial.

the dial in shallow depressions of the housing. There is no recessed handhold for lifting the set, but a 1/16-in. overhang of the faceplate provides a slight projection for fingers and thumb. A dial light operates as the handset is raised. Both letters and numbers of the dial face are seen through the holes of the dial finger-wheel.

Operation.

The 8-type dial is the easiest rotary dial to move and is inclined at an angle of 20° from the horizontal.

Remarks.

Advantages.

The small size of the Princess set takes up little space on a work area. As the handset is near the front of the housing it may be easier for some to reach than the one on a standard desk set. The inclination of the dial and the force needed to move it make it the easiest one to use for those with significant loss of strength in the hands and arms.

Disadvantages.

There is less room for the fingers between dial and handset than on a standard desk telephone, and this may prevent the fingers from being inserted and removed during the use of the handset.

The shallow depression in the housing for the handset and the lack of cradle posts necessitate accurate positioning of the handset on replacing it; the person lacking strength, control, or agility in the arms may find that the handset slips off the telephone.

As there is no recessed handhold, moving the telephone requires normal function in one hand, or the use of both hands, one at either end of the set. Good trunk balance is necessary to perform this. If the Princess set is placed on a highly polished surface it may skid during dialing and require steadying from the other hand.

The numerals of the dial show through the holes of the dial wheel; thus the user must be in a suitable position to see them.

TRIMLINE® TELEPHONE

Rotary Dial *Touch-Tone Dial*

Description.

The handset is curved and wide. It contains the dial and a disconnect button for use between calls. The telephone base houses the switchhook and is available as a desk set or for hanging on the wall. The buttons of the Touch-Tone dial are small and spaced well apart.

Handset weight: Touch-Tone model, 13 oz. Rotary dial model, 12 oz.

Operation.

The handset is designed to be supported at the ear on the palm of the hand. Although the rotary dial can be used with one hand, this hand must have normal function. If hand function is impaired, the use of both hands will be necessary. The Touch-Tone dial may be used by one hand when the fingers can hold the handset and the thumb can be used on the buttons.

Trimline desk telephone with rotary dial.

Trimline wall telephone with Touch-Tone dial.

Using a Trimline telephone in bed.

Remarks.

Advantages.

Use from bed.

A person wishing to dial a number while in bed either has to turn toward a bedside table holding the telephone or to lift the telephone set onto the bed. The Trimline set provides a convenient means of bringing the dial into comfortable position for use.

The Touch-Tone Trimline set has potential for adapting for use by the person without arm function who uses a motorized wheelchair (Fig. 37, p. 121).

Safety factor.

A disabled person living alone who fears that he could fall and be unable to reach a wall telephone could consider the use of a Trimline set. By pulling the cord to dislodge the handset from the hook, the dial could be brought down within reach.

Disadvantages.

The handset is heavy to lift and hold. To support it on the palm of the hand requires full extension of the wrist, a position which is not comfortable, and for some, not possible to attain.

The handset is too wide to be grasped with ease. Grasping it may not be possible for those unable to open their hands sufficiently.

The thickness of the handset is not sufficient for it to be held between ear and shoulder.

The Trimline set with rotary dial may be operated by one hand when hand function is normal. When the hands have less than normal function, both must be used when dialing, because when the handset is placed on a surface, its curved back allows it to rotate. The model with Touch-Tone dial may be used by one hand when function of the thumb is normal: the fingers grasp the handset and the thumb is used to press the buttons.

SPEAKERPHONE

Rotary Dial *Touch-Tone Dial*

Description.

The Speakerphone consists of a loudspeaker and transmitter designed to provide hands-free operation. In addition, regular use of the telephone is provided by a telephone set. There are four units:

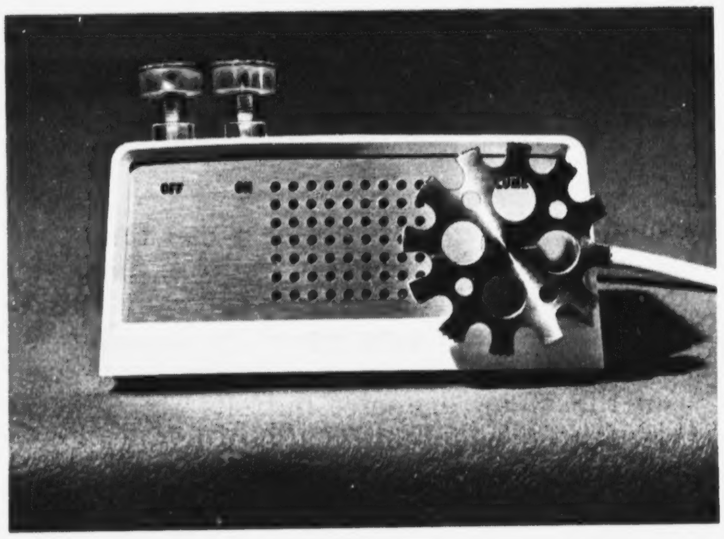
Wall-mounted equipment box.
A standard or 6-button desk telephone with rotary or Touch-Tone dial. (Any other telephone, including the Card Dialer, may be used if desired.)
Loudspeaker.
Transmitter unit. This incorporates two round pushbuttons on its top for "on-off" switches and a volume-control turnbutton on its front for the loudspeaker. (See "Modifications.")

Standard Operation.

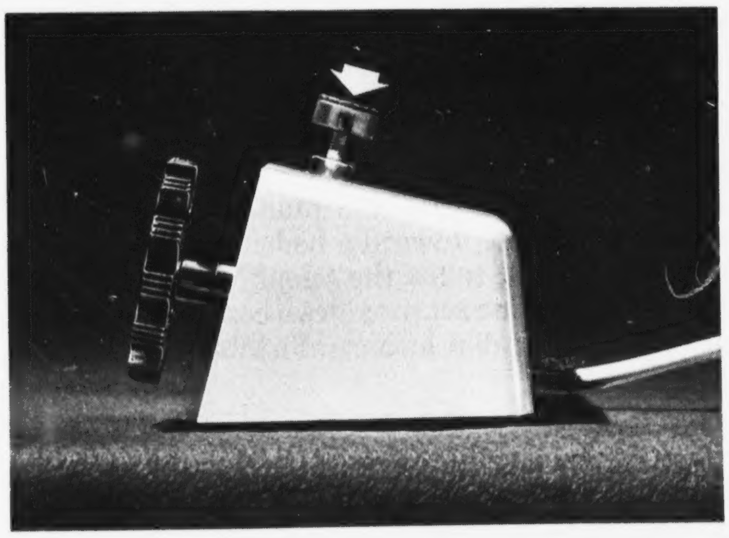
Incoming calls are answered, or a dial tone obtained, by depressing the "on" button; pressure on the "off" button disconnects the call. These buttons are on the sloping top of the transmitter unit and slant slightly away from the user. The tops of the $\frac{1}{4}$-in. diameter buttons are convex and smooth and may be difficult for some disabled persons to depress. A pressure of about 1 lb. 4 oz. is necessary for the "on" button, 12 oz. for the "off" button.

Either the standard telephone or Speakerphone may be used for a call, which may be transferred between them as desired. To transfer a call heard over the Speakerphone to the telephone, the hand-

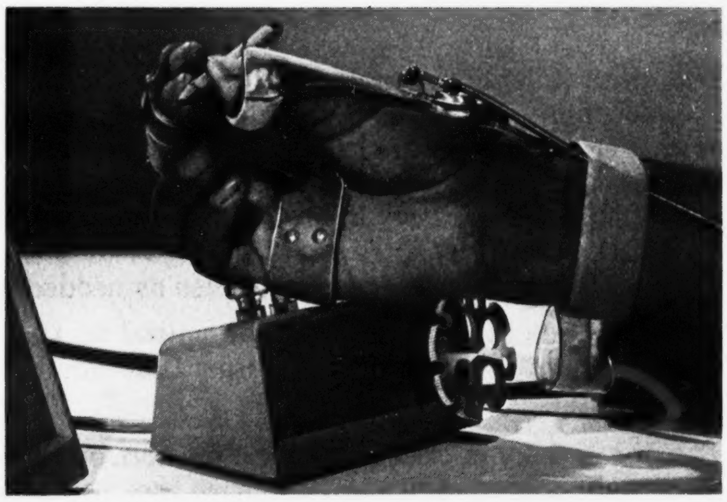
Speakerphone, with desk telephone.



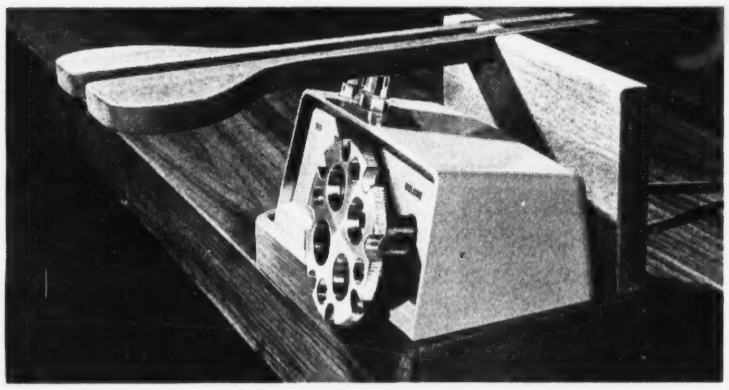
Transmitter with enlarged tops to the "on-off" buttons and a wheel replacing the volume-control knob.



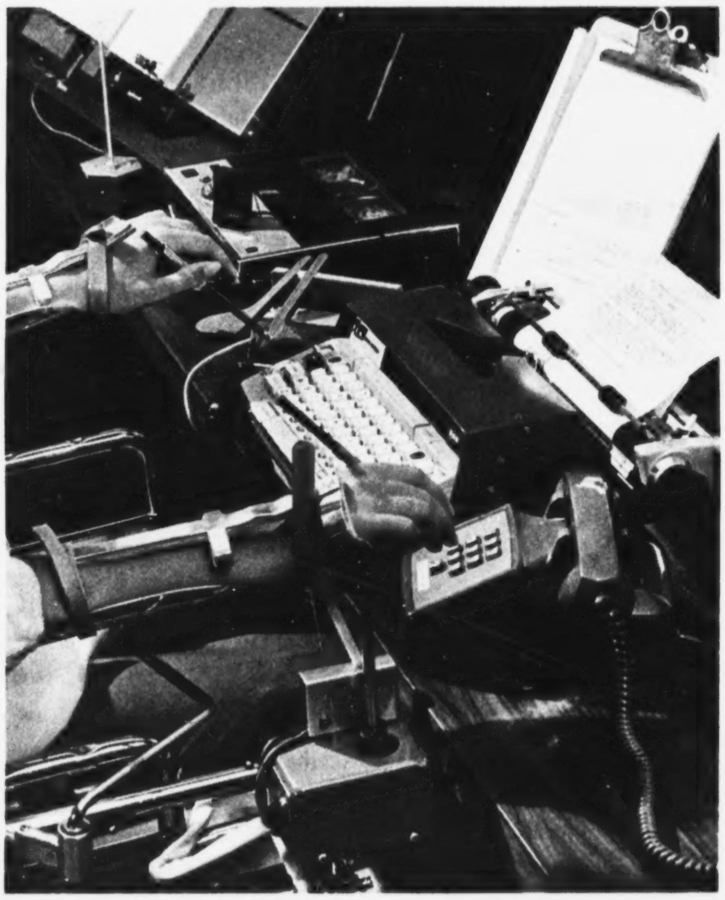
Side view of transmitter, showing the direction in which pressure must be applied to operate the "on-off" buttons.



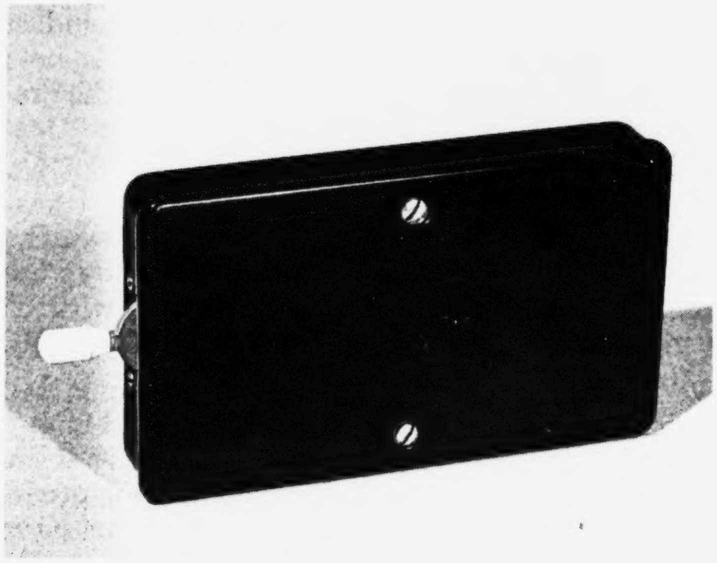
Finger function is not required to operate this modified Speakerphone transmitter.



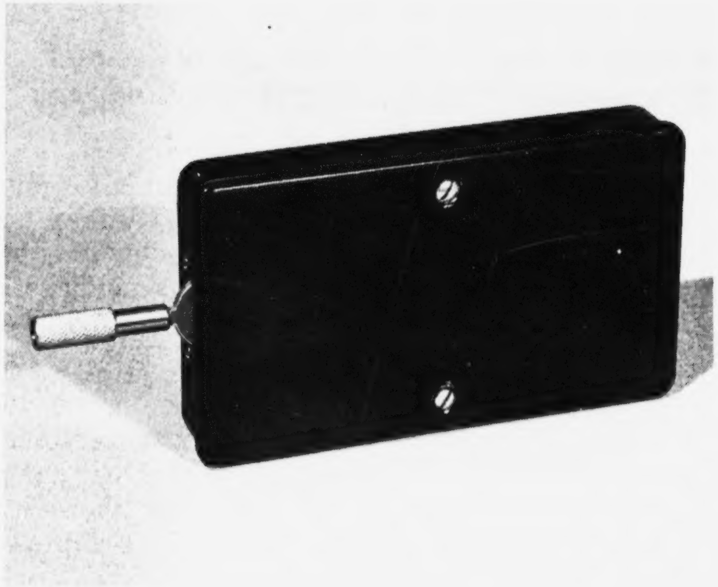
Paddle-lever device for depressing "on-off" buttons.



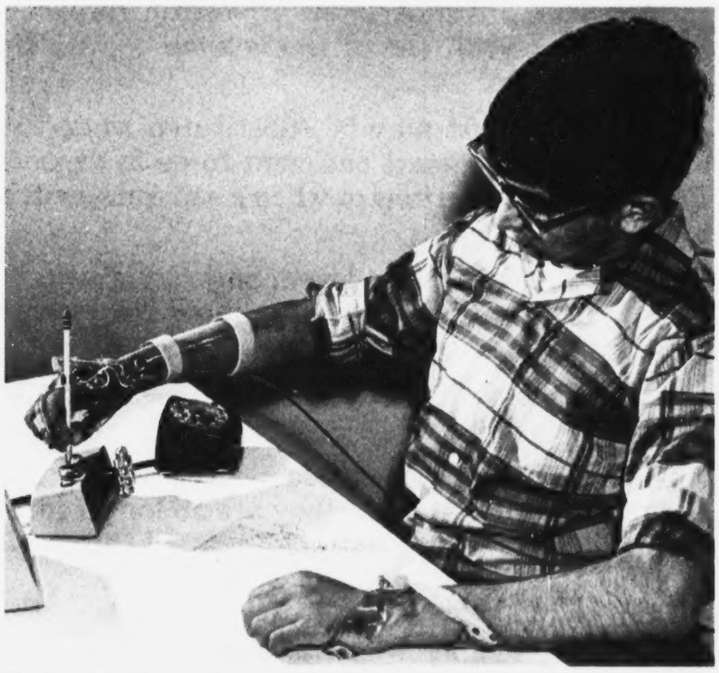
Operating the paddle-lever device by typing stick.



6017-type key (6017AA).



6017-type key, with 2-in. toggle lever.



Substitution of a separately housed dial for a desk set to conserve working space.

set is lifted. To transfer the call from the handset to the Speakerphone, the "on" button is held depressed while replacing the handset in the cradle. (See "Special Technique for the One-Handled," p. 113.)

During a call over the Speakerphone, the transmitter may be inactivated by holding down the "on" button—a privacy feature which allows the user to talk to someone else at his end without being heard by the caller at the other.

The mounting cords of the transmitter unit and loudspeaker allow these units to be placed in any position convenient for the user, provided that the units are three feet apart. This distance is necessary to prevent feedback between them inducing an acoustical howl. The transmitter unit should face the user; it is preferably placed at arm's length, although it will pick up conversation fairly adequately at distances up to six feet.

Modifications and Accessories by Special Arrangement With the Telephone Company

Switches.

The "on-off" buttons may prove difficult for the disabled person to depress. His difficulty may be due to the shape or smoothness of the buttons or because his upper extremity lacks sufficient strength to depress them. The following may be done:

1) The tops can be enlarged by attaching special assembly plastic discs with non-slip surfaces which can be provided by the Telephone Company. These assist the person who has to use his wrist, a writing device, or a prosthetic hook to depress the buttons.

2) A special assembly paddle-lever device allows the user greater latitude in using the buttons since he can approach them from any angle and need employ little pressure. Their projection, however, can interfere with use of the volume control by the left-handed.

3) Other switches may be substituted when the user is unable to exert sufficient force to depress the transmitter buttons or when a separate switch is needed.

A *6017AA* Key (a toggle-lever non-locking switch) may be used. (With special assembly 2-in. lever: pressure to operate and to release, 2 oz.)

If a *microswitch* is used, additional electrical relays will be needed.

These switches may be placed in any position convenient for the user since they are no longer integral with the transmitter unit.

Volume-Control Knob.

A special assembly wheel is available from the Telephone Company in place of the standard pinch-operated turnbutton. Insignificant movement and strength is necessary to move the wheel.

Dial.

The desk telephone provides the dial for the Speakerphone, but if the handset is unlikely to be used, a separately housed dial can be substituted to allow greater working space to the patient. If desirable, the separately housed dial may be positioned at a distance, since its light weight enables the user to draw it toward him for use as needed.

This lightweight unit may not be suited to the ataxic patient, as he will need a unit that cannot be displaced.

The lower height and flatter inclination of the separately housed dial compared with the desk set will have an advantage for some persons.

Loudspeaker.

Conversation is not private when a loudspeaker is used. Some very disabled persons who need to hold confidential conversations may wish to have a lightweight receiver that can hook over the ear, such as is used for transcribing dictation.

(If the disabled person expresses a desire for such a special assembly, the evaluator should consult the Marketing Coordinator of Telephone Services for the Handicapped.)

Mounted to Be Portable.

The person using a Speakerphone who wishes to use it in different rooms may consider having wall jacks installed and all the units of the Speakerphone mounted on a wheeled table or small cart. Moving it between jacks is possible when the equipment box can be moved; the cart is necessary to move its weight and bulk. When the cart is in place, the transmitter and telephone set (or separately housed dial) may be moved within the person's reach as appropriate.

"Calling Party Control".

Under certain circumstances the person living alone who fears a mishap, where he will need assistance and be unable to reach the telephone, may have the Speakerphone wired so that a call will come through without any action on his part. (See "Special Facilities and Services for Summoning Assistance," p. 131).

Remarks.

Advantages.

The Speakerphone allows freedom of movement for those unable either to grasp or to hold a handset because of loss of range of motion, muscle weakness, or loss of coordination.

It enables the one-handed to use his remaining arm for reasons other than holding the handset, such as taking notes, referring to papers, etc.

The severely disabled person who can reach the switch needs only to talk on receiving an incoming call; he does not need to alter his position in any way to carry on a conversation.

The severely disabled person unable to reach a switch can receive an incoming call without operating a switch if his Speakerphone is arranged for "Calling Party Control."

Disadvantages.

The Speakerphone does not allow conversation in private unless the handset can be used.

The transmitter unit will pick up sounds in the background making it unsuitable for use in a noisy location.

The Speakerphone may take up too much desk space.

The Speakerphone is a premium item and the cost may be higher than some handicapped people with limited resources can afford.

NOTE: In the event of a power failure, the desk telephone can be used but the Speakerphone portion of the set will become inoperative.

DESK TELEPHONES WITH HEADSET JACKS (JACK-IN-BASE SETS)

Desk Telephone with Headset Jack.
Rotary Dial (514)
Touch-Tone Dial (1514)

6-Button Desk Telephone with Headset Jack.
Rotary Dial (563HL)
Touch-Tone Dial (1563HL)

Description.

The telephone housing incorporates a jack into which a headset may be plugged, and a turnbutton "on-off" switch for connecting a call to the headset. (A headset jack is available also on the Card Dialer.) The height of the dial (above the surface on which a set is placed) is greater for the 6-button set.

Operation.

By leaving the handset on the cradle, the switch to the headset can be used to connect and disconnect calls, or the telephone may be used as a standard desk set by lifting the standard handset. An ongoing call may be transferred from handset to headset by switching "on" before replacing the handset, or from headset to handset by lifting the handset before switching "off" the headset switch.

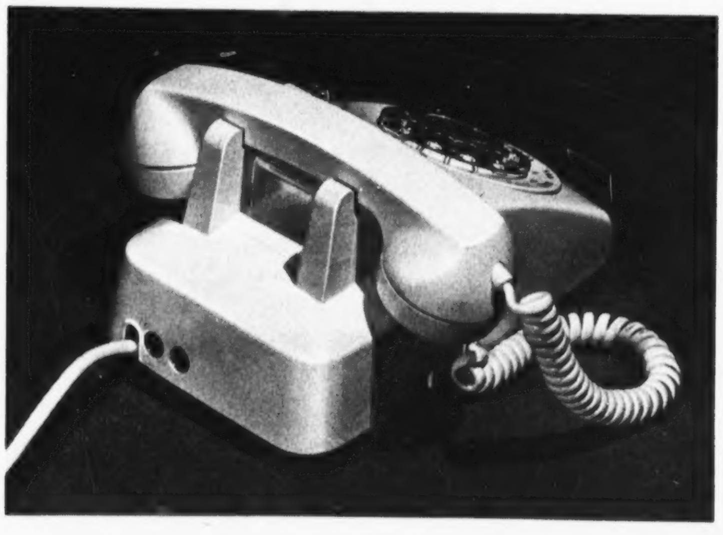
The standard installation has a turnbutton that is grasped between finger and thumb and rotated through 90°. A special assembly ¾-in. (or 1½-in.) lever may be placed over it to move 90° in a horizontal plane through a range of 1¼ in. (or 2½ in.). Pressure "on" is 4 oz. (or 2 oz.); pressure "off" is 1¼ oz. (or ½ oz.).

Headsets.

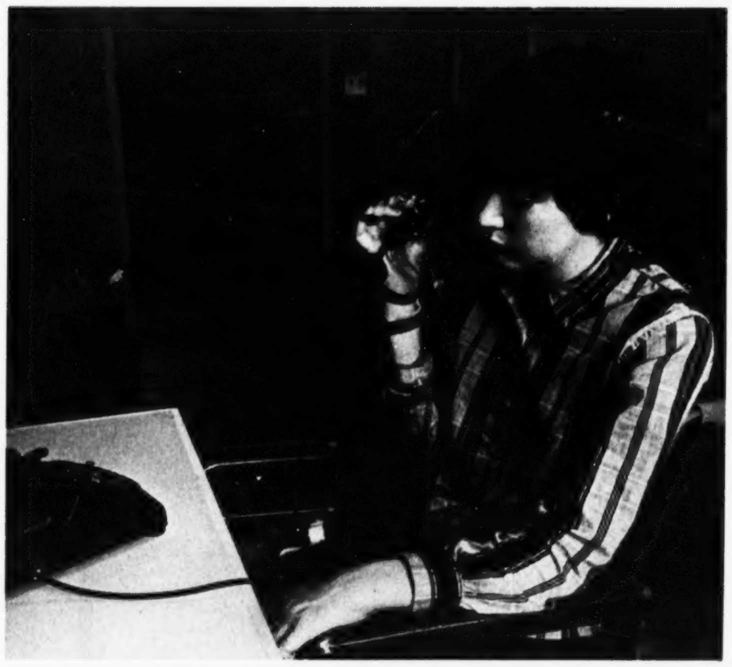
Operator's headset, Wear-it-or-Hold-it headset, lightweight headset.

Desk telephone with headset jack, rotary dial. ¾-in. lever.

6-button desk telephone with headset jack, Touch-Tone dial. 1½-in. lever.



View of headset jack.



Use with Wear-it-or-Hold-it handset.

Use with handset-holding gooseneck arm.

Use with lightweight headset.

Use with operator's headset (52-type).

Handsets.

A standard handset is part of the telephone; the Wear-it-or-Hold-it set as handset may be plugged into the headset jack. (Volume control handsets *cannot* be plugged into the headset jacks of the above desk telephones due to their circuit arrangements.)

If for some reason two standard handsets are needed (see p. 65) an *operator's handset* may be plugged into the jack. Due to the circuit arrangements, the transmitted volume of the user's voice will be raised slightly.

Supplemental Equipment.

A 541A jack and 504A plug, to enable a 6-button telephone to be transferred between wall jacks, can be made available under certain circumstances.

Special Assembly.

A red signal light (similar to a message waiting light) for indicating a connected circuit may be installed on special order as a reminder for the confused person to turn off the switch when terminating a call.

Remarks.

This type of telephone is particularly useful for an installation utilizing a headset, or the Wear-it-or-Hold-it handset, and a lever switch, where other persons wish to use the same telephone as the disabled person.

In the rare case of a person needing to use a headset while leaving the handset off the cradle (and thus having no means by which to disconnect the circuit), a 6-button desk telephone with headset jack may be used, and its line button employed as the "on-off" switch.

4A KEY EQUIPMENT

Rotary Dial *Touch-Tone Dial*

Description.

The equipment is designed for operation of a headset. It consists of 4 units:

Wall-mounted equipment box.
Externally mounted jack and key unit.
A separately housed dial.
A headset.

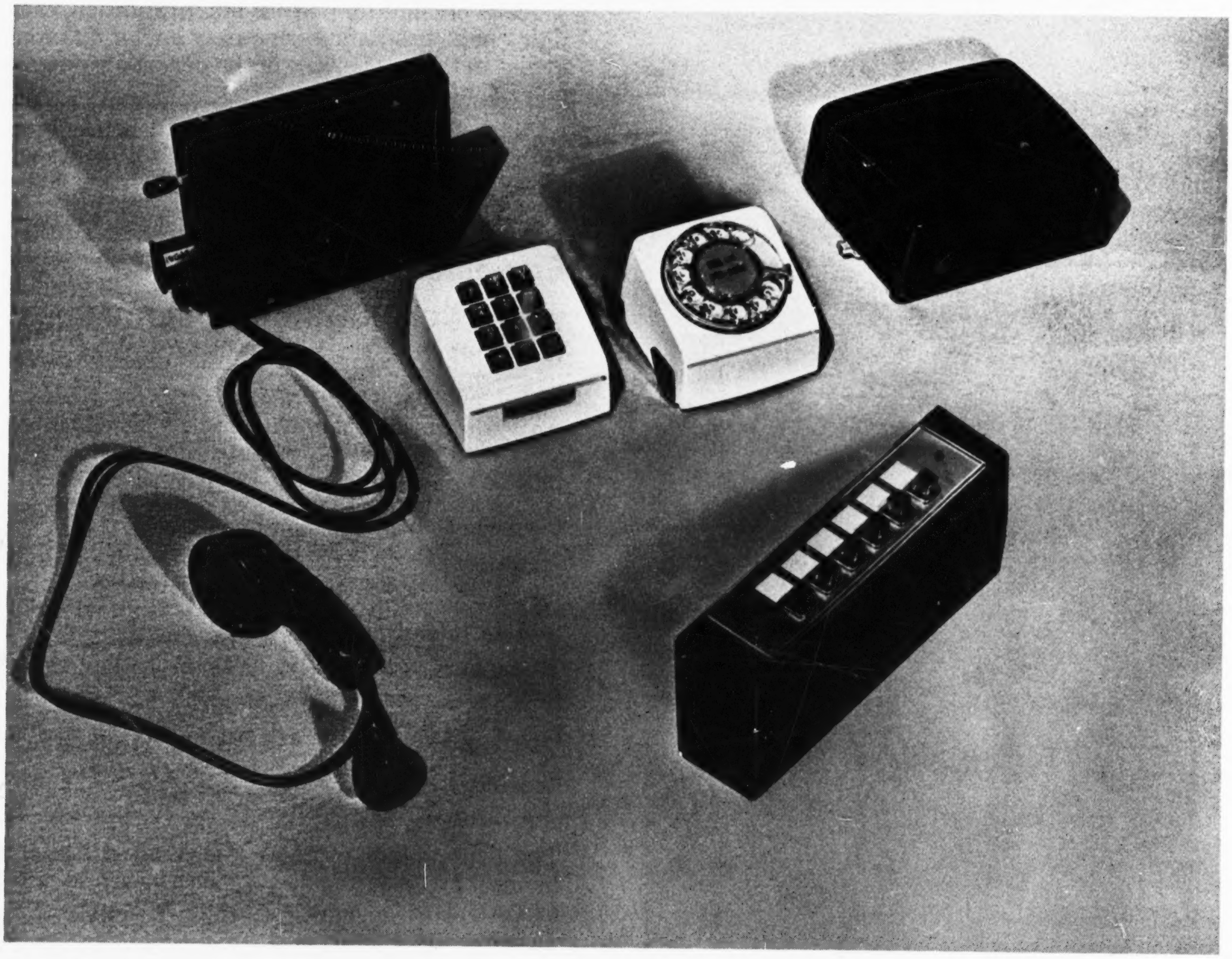
The equipment box requires permanent attachment to a wall, desk, or table. Nevertheless, when it is desired to use 4A key equipment at more than one site, it is possible to attach all the units to a board that can be brought to the disabled person.

Jack and Key Unit.

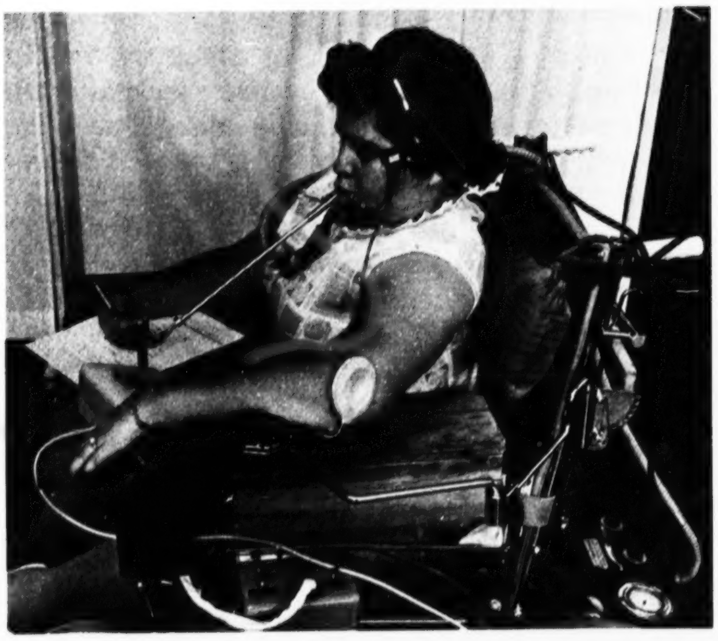
The unit is a flat box, 1³⁄₁₆ in. thick by 5⁷⁄₁₆ in. wide and 7 in. long. The headset jack and the toggle switch are side by side along one edge. The toggle-lever switch (locking type) is moved into one position for "on" and returned for "off." A pressure of about 10 oz. is required to switch "on," and of about 4 oz. for "off." This force may be reduced by providing a longer lever (special assembly) for the toggle switch. A 2-in. lever will reduce the force to about 6 oz. "on" and 2½ oz. "off."

Dial.

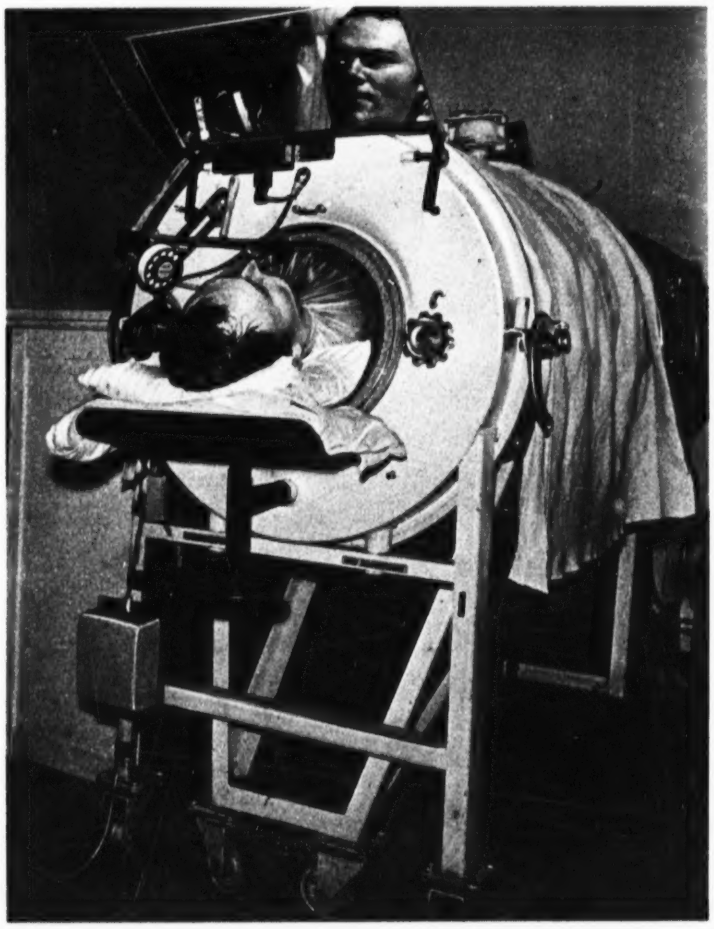
Separately housed rotary: 1008B is most suitable. Where available, separately housed Touch-Tone: 1025A3.



***4A key equipment** At rear, left to right—6026 key (unmodified) with Wear-it-or-Hold-it handset, separately housed dials, equipment box. Front—Externally mounted 6-button unit (6050 key).*



Modified 4A key equipment carried on a wheelchair (p. 119).



Modified 4A key equipment used on a tank respirator (p. 129).

Headsets.

Operator's headset, Wear-it-or-Hold-it headset, lightweight headset.

Handsets.

Wear-it-or-Hold-it set as handset. The telephone circuit arrangements do not permit a volume control handset to be plugged into a headset jack. An operator's handset may be used if a regular type handset is needed. (The circuit arrangements will increase the volume of the transmitted speech).

Supplemental Equipment.

Externally mounted 6-button unit *(6050 key).*

Customer provided equipment.

Gooseneck handset-holding arm for Wear-it-or-Hold-it set.

Remarks.

The use of separate units has an advantage when compared with a telephone set for the person who has limited arm motion. The units may be placed around the outer edge of his reach to free as much space as possible for writing, etc. In addition, each unit can be positioned separately and at different angles to take advantage of the person's strongest movements.

4A key equipment is appropriate when a lever switch separated from a telephone set is needed.

Equipment for Conversation

WEAR-IT-OR-HOLD-IT HEADSET-HANDSET (53-type)

Description.

An 8½-oz. non-adjustable unit may be held in the hand as a handset or, by attaching a headband, may be worn as a headset.

Customer-Provided Equipment.

A gooseneck arm for holding the Wear-it-or-Hold-it handset allows "hands-free" operation.

Related Telephones.

Telephones with headset jacks, or 4A key equipment.

Used as Handset

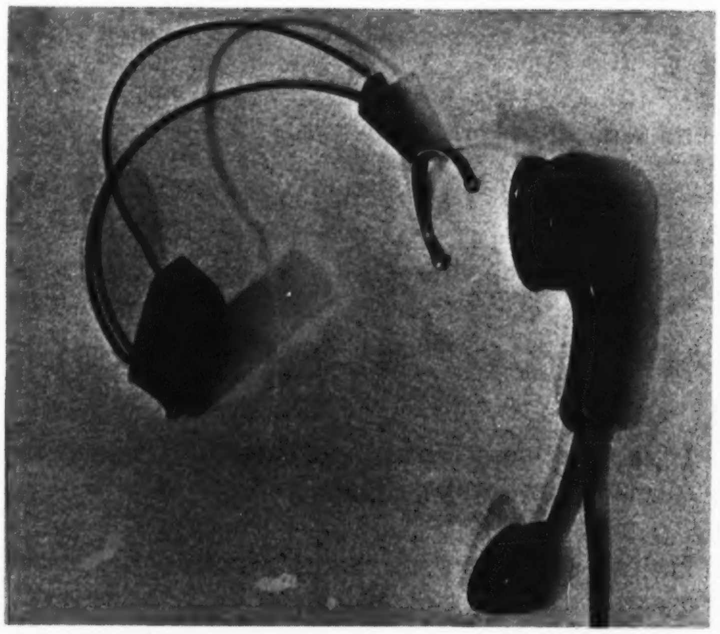
Remarks.

Advantages.

The light weight of 8½ oz. may allow use of a handset by those unable to hold the heavier (11½ oz.) standard G3 handset.

Disadvantages.

The Wear-it-or-Hold-it set consists of a receiver on a short handle connected by a rod to a small transmitter. This makes the handset top-heavy.



Wear-it-or-Hold-it handset, with headband detached.

Holding it is difficult except at the top of the handle. A comparison of the standard handset and the Wear-it-or-Hold-it set used as handset is tabulated on the page following.

Used as Headset

Remarks.

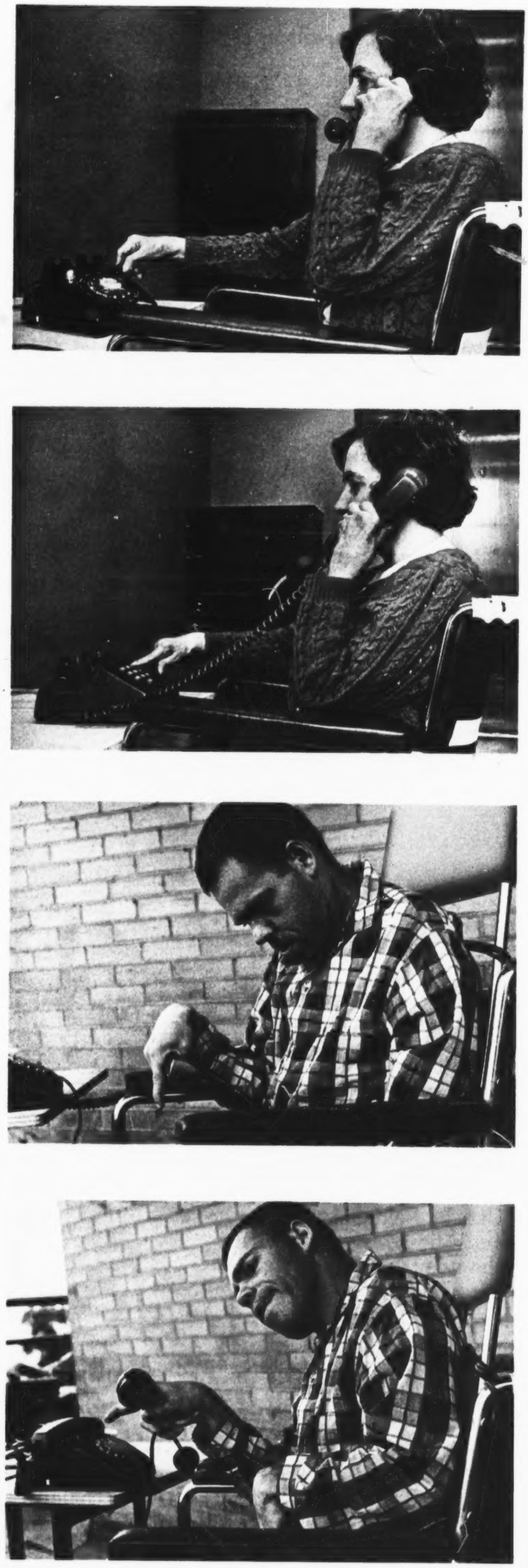
Advantages.

The Wear-it-or-Hold-it set may be picked up for use as a handset by the one-handed and then if this hand should be needed for other purposes, such as taking notes, the headband can be moved into place to convert it to a headset.

When an assistant needs to place a headset on the head of a disabled person, the Wear-it-or-Hold-it set is the simplest one, as it has only one adjustment—where the receiver swivels on the headband.

Disadvantages.

The weight of 8½ oz. will quickly cause discomfort for the person unable to adjust it on his ear. Under these circumstances it is suitable only for brief conversations.



Wear-it-or-Hold it Handset in use

(a, b) The Wear-it-or-Hold-it handset can be held with comfort only by its handle. The handle is positioned at the top of the handset, so this patient with rheumatoid arthritis must raise her arm higher than when using the standard handset. This position may not be comfortable for a prolonged conversation.

(c, d) The heavy weight of a standard handset aggravates this patient's spasticity and prevents him from placing the handset against his ear when his wrist is in this position. The lighter weight of the Wear-it-or-Hold-it set does not affect the position of his wrist as markedly.

Comparison of Standard (G Series) Handset and Wear-it-or-Hold-it Handset

	Standard (G Series) Handset	*Wear-it-or-Hold-it Handset*
Weight:	G1 = 14 oz. G2 = 13½ oz. G3 = 11½ oz.	8½ oz.
Balance:	Good	It is top-heavy and, in addition, it tends to rotate around its long axis.
Position of the hand in gripping the handle:	The shape of the handle does not restrict the grip to one area.	Unless there is good hand function to allow grasp of the rod or transmitter end, the handle may be held only at the top. This necessitates a greater flexion at shoulder and elbow, with little opportunity to change position for relaxation. This may not be important, if the person can rest his elbow on desk or lapboard.
Balance in web of thumb:	Reasonably stable.	The less bulky handle with its unbalanced weight tends to rotate.
The possibility of being used by those without wrist and finger function (as described on p. 71):	A standard handset is unsuitable because the weight pulls it out of the fingers.	The Wear-it-or-Hold-it set is placed face down on the table, positioned to cross the palm of the hand and with the receiver end toward the thumb. When the wrist is supported by an orthosis and the fingers have some tightness in flexion (see Fig. 7, p. 71), the hand may be pushed forward so the thumb goes under the rod, and the fingers over it. The hand then slides up onto the handle as far as possible, with the other hand blocking the handset to prevent its moving. Turning the hand palm-up brings the receiver to rest on the thumb, and arm movement will bring the handset to the head. If the hand cannot be placed on the handle past the balance point of the Wear-it-or-Hold-it set, the handset can slip out of the hand during the turning movement. This may be prevented by pre-positioning the receiver end 1-inch higher than the transmitter end (Fig. 7e).
Effect on those with loss of control over movement:	The effect will vary according to the type of incoordination. Both handsets should be tested.	
Can be held between ear and shoulder; used with shoulder rest, or by leaning back, rested on shoulder and chest:	Yes	No
Can be used with Sparr Arm:	Not preferred equipment.	Preferred equipment.
Can be used with Luxo Arm:	The weight of a G-series standard handset is necessary for balance of the counterbalanced arm.	Not suitable.

Amplification for those with impaired hearing:	Yes. Impaired hearing handset (G6), 12⅛ oz.	Not available.
Amplification for the voice:	Yes. Weak speech handset (G7), 13½ oz.	Not available.
Transmitter cutout switch for use in excessively noisy location:	Yes. Noisy location handset (G8), 13 oz. Push-to-talk handset (G5).	Not available.
Related telephones:	Standard on all sets except 4A key equipment.	The circuit arrangements allow this set to be used only with 4A key equipment or telephones with headset jacks.

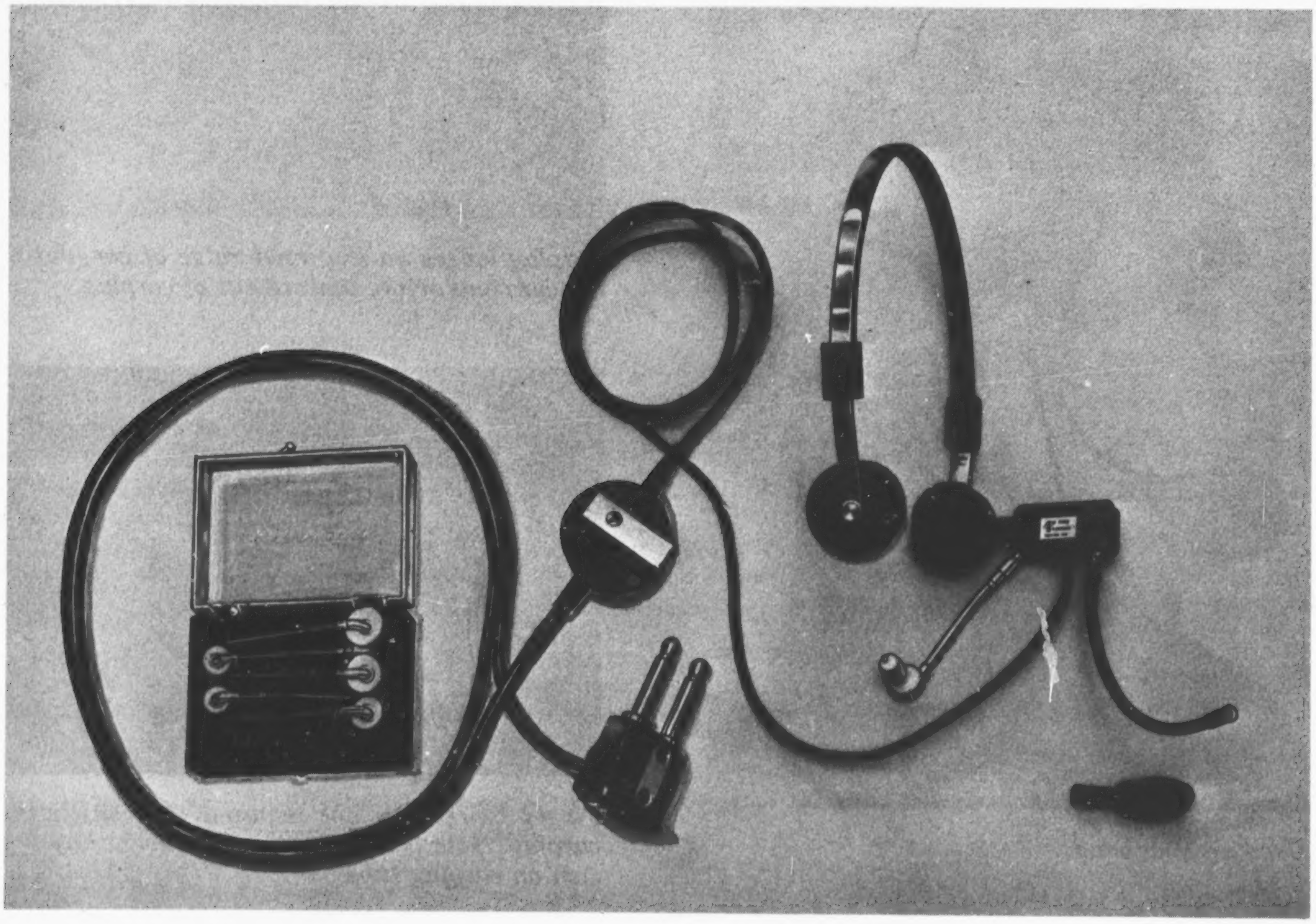
LIGHTWEIGHT HEADSET (KS-19796)

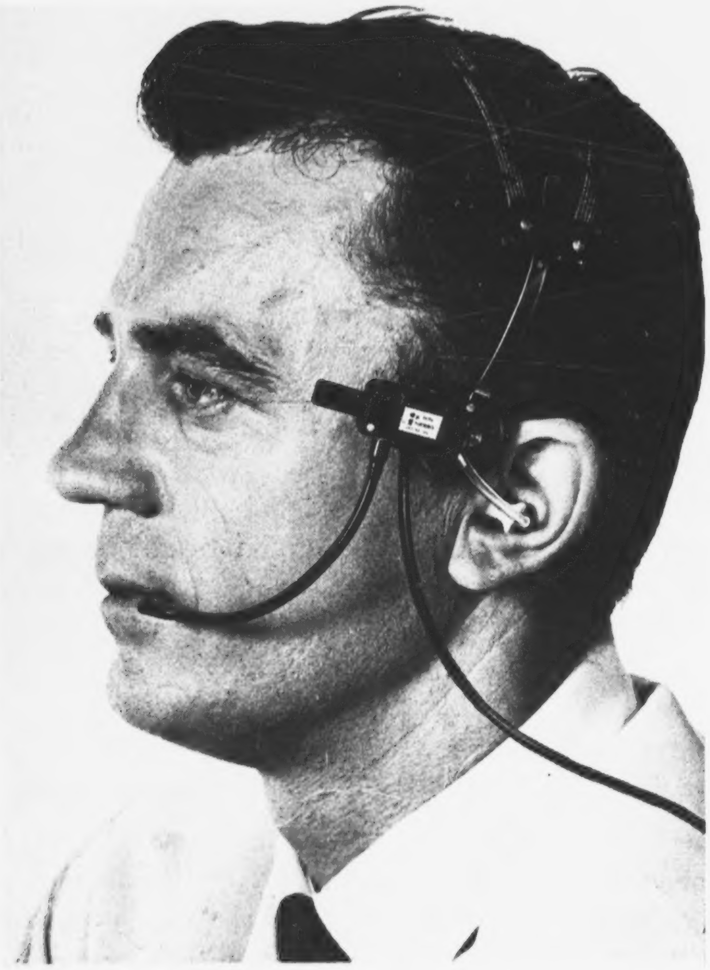
Description.

A transistorized lightweight (¾ oz.) set to be used on the adjustable headband (weight, 1 oz.) or clipped on to the frame of eyeglasses. The transmitter and earplug receiver have simple adjustments for optimum placement, and a selection of different sized earplugs is provided. The plug-in cord holds a clip-on amplifier (weight, 1½ oz.) that may be placed in a shirt pocket, clipped onto the front of a blouse or onto a lanyard hung around the neck.

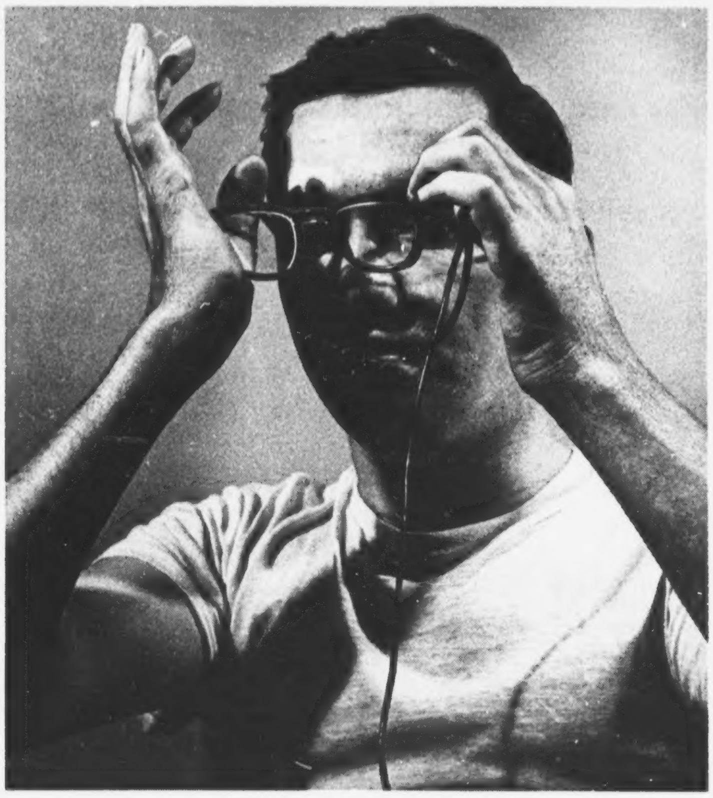
Used on Headband.

The curved plastic headband maintains its position on the head by tension on two sponge-lined pressure pads. The use of both hands and

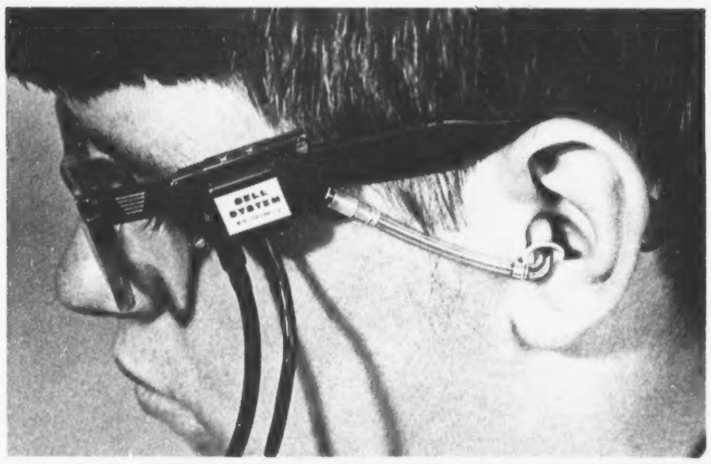




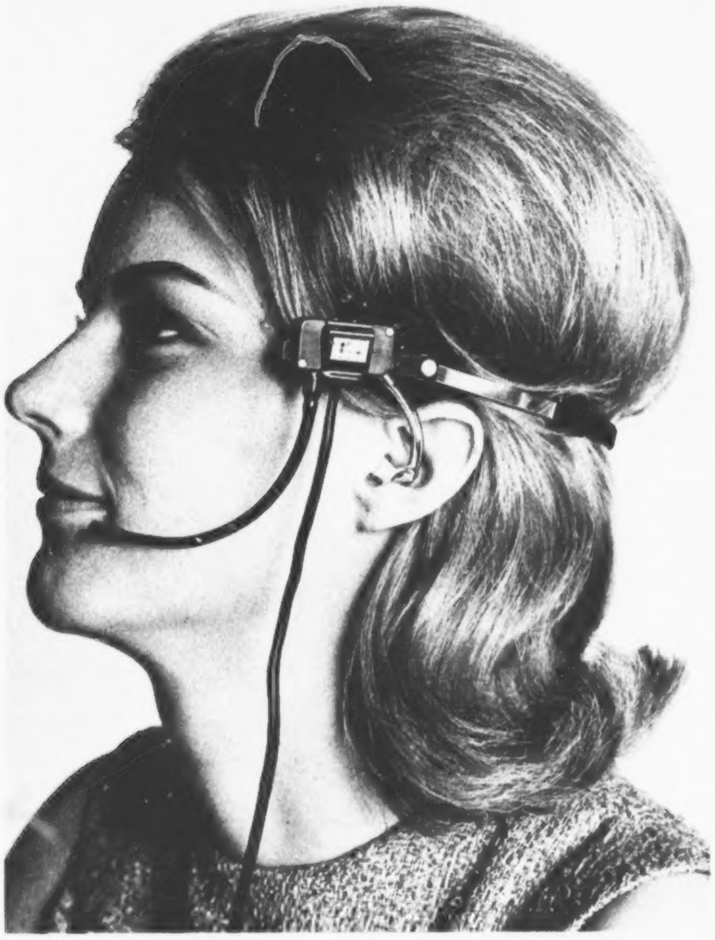
Used on headband. (Position of earplug for normal use.)



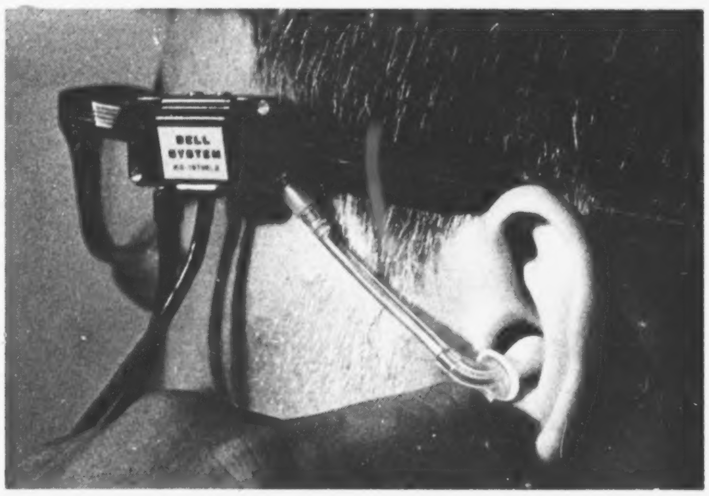
Used on eyeglass frames. Finger function is not required to place the frames on the head.



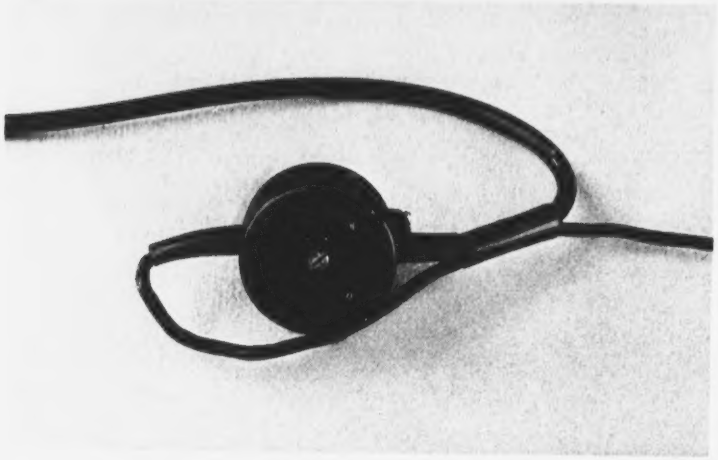
Earplug lodges on the inner ridge of ear, out of the ear canal. Note upward tilt of earplug.



Used on headband.



Finger function is not required to position this earplug. Note position of clip to prevent any tension on earplug tube.



Cords of the clip-on amplifier taped together for use in breast pocket.

enough strength to pull the sides apart is required to place the headband on the head. When the choice of this equipment is being considered by a person unable to adjust the headband, and he wishes to wear it for prolonged periods of time, he should first test his tolerance to its pressure by wearing the headband for a comparable time.

Used on Eyeglass Frames.

Those who can put on their eyeglasses can use the lightweight headset without assistance. Those who have no need for eyeglasses might consider using empty straight-sided frames for attachment of the lightweight headset.

The clip for use on glasses is very stiff, requiring considerable strength in the hands and arms to slide it onto the frame. It may be more convenient, therefore, to leave the set attached.

Earplug.

The earplug should not be inserted into the external auditory canal in cases where the wearer would have difficulty reinserting it. Instead, the lip of the earplug should rest out against the lower ridge of the external ear. The tube is twisted to allow the earplug to point slightly upward. The set must be clipped onto the eyeglass frame at the correct place to avoid tension from the tube causing the earplug to displace. The transmission of sound is excellent and the earplug cannot easily be displaced from this position.

A person lacking sensation in his hand may be unsure of its position when it is out of sight by his ear; connecting the circuit for the sound of the dial tone will provide the assistance of a signal to guide him in placing the earplug.

Those unable to remove the earplug who express fear of loud noises in the ear may be reassured that the lightweight headset (as all other Bell equipment) has safety devices to screen out excessive noise.

Amplifier.

When the amplifier is to be placed into a breast pocket, the bottom cord may interfere with its entry. The top cord should be brought toward the bottom one where they may be taped together above the amplifier. The amplifier will now project from one side and may be placed in a pocket more easily.

Transmitter.

The transmitter is very sensitive and should not be placed directly in front of the mouth; its tip should be ½ in. from the corner of the mouth.

Supplemental Equipment.

To shield the sensitive transmitter from picking up room noise, an *acoustic coupler* may be used.

Related Telephones.

Telephones with headset jacks.
4A key equipment.

Remarks.

The lightweight headset is preferred over the other headsets.

Advantages.

The lightweight headset may be worn in comfort for prolonged periods of time, adds little weight to the neck, will remain in place when the user reclines, or when uncontrolled movements occur. It does not interfere with the use of a mouthstick and is simple to adjust and to place correctly.

Disadvantages.

Some may not care for the pressure of the headband, wearing eyeglass frames or using an earplug. The occasional user may not feel the extra expense of the set is warranted.

OPERATOR'S HEADSET (52-type)

Description.

The headset in general use for switchboard operators and office personnel. It weighs 10 oz. and has four adjustable parts: headband, receiver, transmitter, and adjustable transmitter arm. Two models are available: with a straight transmitter arm or with a looped transmitter arm.

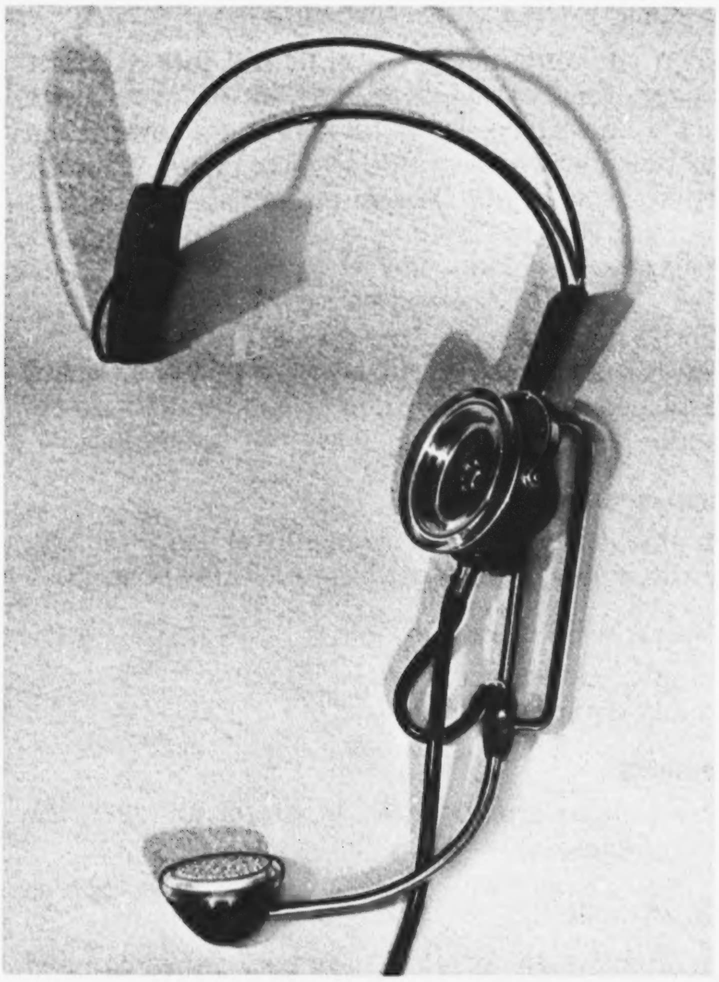
Related Telephones.

Telephones with headset jacks. 4A key equipment.

Remarks.

Advantages.

All headsets leave the hands free, and the operator's headset is the most economical. It can be put on with only one hand by an alert and physically capable person (p. 113).



Operator's headset.

Operator's headset in position, front view.

Operator's headset in position, side view.

Operator's headset in position, side view.

Disadvantages.

When the disabled person cannot raise his hand or shake his head to adjust the set, the operator's headset can become uncomfortable. It tends to dislodge, particularly when used lying down. Those who have weak or painful necks, sensitive or scarred skin, or who suffer from recurrent headaches are often unable to tolerate it.

Its many adjustable parts require good understanding by the user or by an assistant wishing to place it accurately on another's head.

VOLUME CONTROL HANDSETS

Impaired Hearing Handset (G6)
Weight: 12⅛ oz.

Weak Speech Handset (G7)
Weight: 13½ oz.

Noisy Location Handset (G8)
Weight: 13 oz.

Descriptions.

These handsets may replace a regular G-type handset on any telephone. Each amplifying handset has a control wheel in the handle for adjusting the volume of sound received (impaired hearing, noisy location) or transmitted (weak speech). The noisy location handset, in addition, has a round pushbutton to cut out the transmitter. Volume control handsets are heavier than the 11½-oz. standard (G3) handset.

Remarks.

Impaired Hearing Handset.

Apart from its use by those lacking full auditory function, it could prove useful in situations where the handset cannot be brought close to the ear. The user would have to raise his voice, however, for adequate transmission of speech.

One point must be noted: When the ear does not

Volume control handset. (Either G6 or G7: these handsets are identical in appearance.)

provide a good seal to the receiver, turning up the volume beyond a certain level produces an acoustical howl.

Weak Speech Handset.

This is used by those without adequate voice volume. Its use as a means of conserving breath by speaking softly (for those with a low breath reserve as, for example, in pulmonary emphysema) has not been evaluated.

Noisy Location Handset.

When listening, the button for reducing transmitter pickup and increasing receiver amplification may be held down by a finger or thumb of the holding hand, or by a finger or thumb on the other hand.

The noisy location handset has no special function in aiding the physically disabled. It allows the user to hear adequately under extremely noisy conditions.

HANDSET-HOLDING DEVICES

Sparr Telephone Arm *(commercially available)*

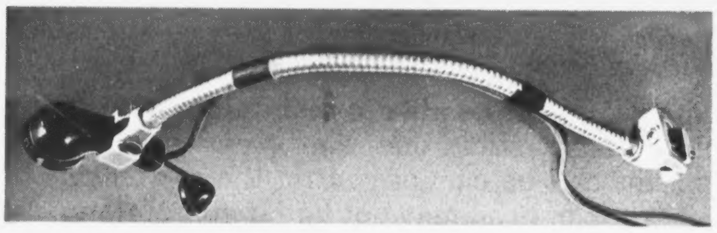
Description.

A stainless-steel gooseneck arm, one end of which can hold a Wear-it-or-Hold-it handset, while the other clamps to a desk or table. It may be used with a standard handset, but the lighter weight of the Wear-it-or-Hold-it set is recommended by the manufacturers. The arm is sufficiently rigid to maintain its position when the user presses his ear to the receiver, yet flexible enough to allow its alteration to any configuration.

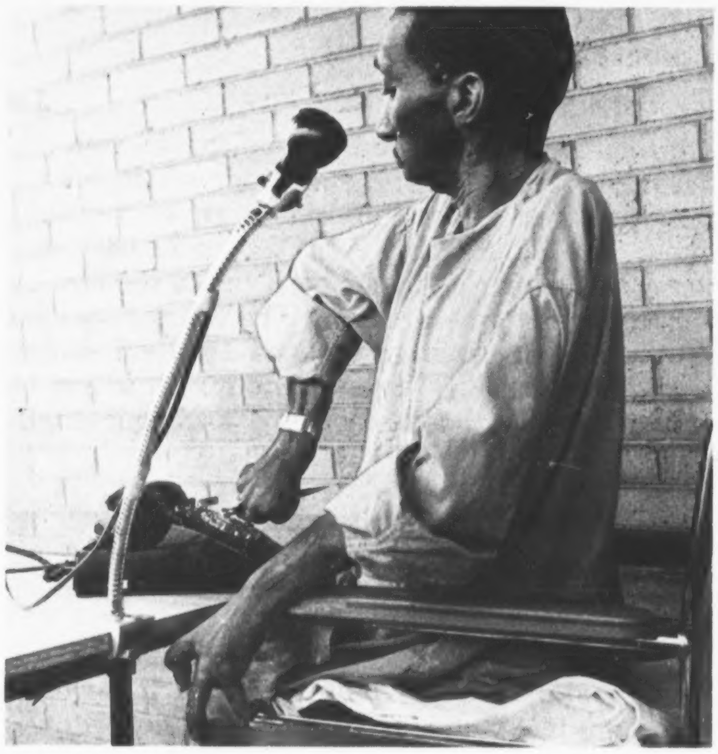
Operation.

The person with sufficient arm function can move the Sparr arm toward him and away by pushing on the gooseneck after the angle of the handset has been set. Accurate alteration of the position of the handset, however, requires adequate muscle power and the ability to use both hands. For these reasons, it is most suitable when left in position for use.

A disabled person may not be comfortable when the handset is placed by his ear for long periods; it is preferable to place the handset at a short distance so that he may move toward it and away as necessary. Thus the user must have adequate trunk motion to allow this. If the Sparr arm is to be attached to a wheelchair, a clamp other than the one supplied will be necessary. (See "Reclining-back Wheelchairs," p. 126.)



Sparr telephone arm. A Wear-it-or-Hold-it handset is secured in the clamp at one end.



The Sparr telephone arm in position for use

Related Telephones.

When the Wear-it-or-Hold-it handset is used, 4A key equipment or a telephone with a headset jack can be used.

If a standard or volume control handset is used, any telephone incorporating a line switch is suitable.

Source.

Available in 22-in. or 29-in. lengths from the Sparr Telephone Arm Co., Rd 1, Box #241, Stroudsburg, Pa. 18360.

Remarks.

Advantages.

The Sparr arm is an economical holding device for those unable to use a handset, and is sufficiently stable to allow the user to press his ear to the receiver. It allows the one-handed to use the remaining arm for reasons other than holding the handset, such as taking notes, referring to papers, etc. A gooseneck arm is particularly suitable for those persons lacking arm function who are able to move the head and trunk toward it and away as necessary.

Disadvantages.

The user must be able to maintain a position by the handset, thus one who experiences muscle spasms or who cannot control the movements of his trunk or head may not find it appropriate.

The person who wishes to write may find difficulty in using the Sparr arm when he attempts to lean forward, unless he can also move the handset.

Luxo Extension Arm
(commercially available)

Description.

A spring-counterbalanced, hinged arm for holding a standard handset, the holder for which allows prepositioning of the handset at an appropriate angle. The hinged arm itself moves in only one plane, but a bearing in the base allows the arm to turn to face in any direction. The bearing may be left free or its position secured by a set screw. Available with a "C"-type clamp for attaching to desk or table, with a desk base, or as a floor stand.

Operation.

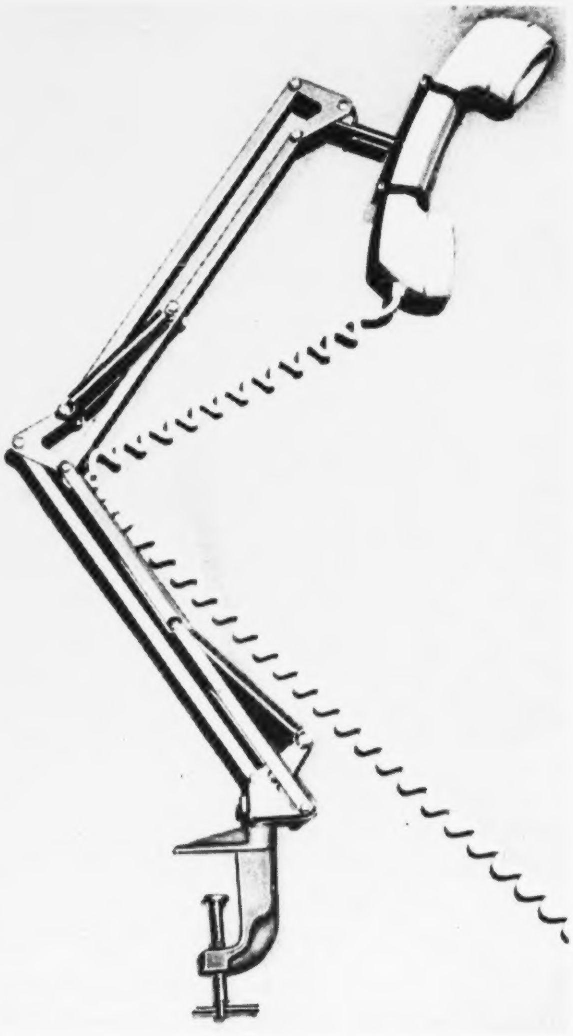
The hinged arm allows the comparatively weightless handset to be pulled toward the user as needed and pushed away afterward.

Related Telephones.

Since a standard or volume control handset is used, any telephone incorporating a line switch is suitable.

Source.

Available from Luxo Lamp Corporation, Dock Street, Port Chester, New York as a 30-in. arm with clamp; a 45-in. arm with clamp; with a desk base; with a floor stand.



Luxo extension arm. A standard handset is secured in the clamp at one end.

The Luxo extension arm used by the person able to move a comparatively weightless handset to his ear and away.

Remarks.

Advantages.

The Luxo arm is most suited to those who want a comparatively weightless handset and who have sufficient arm movement to move it toward them and away and, occasionally, to press it against the ear. Among such persons, it may prove of additional assistance to those with limited desk space. Forward movement of the head and trunk for note-taking during a telephone conversation is possible with the Luxo arm when the user can simultaneously move it into position.

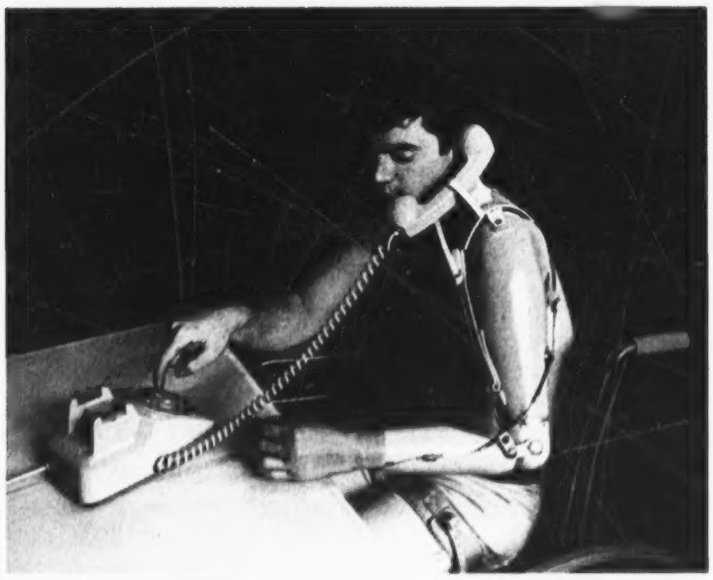
Disadvantages.

The Luxo arm is bulky in appearance; it moves when the ear presses against the handset. It has not been found suited to those lacking arm function.

Shoulder Rest *(commercially available)*

Description.

This attachment for a standard handset is used to allow the handset to be held on the shoulder by pressure from ear and chin. Various models are commercially available, of which the most suitable are those allowing for adjustments between the shoulder and the handset.



Shoulder rest in use.

Source.

Available from office-supply and stationery stores.

Remarks.

Advantages.

Use of a shoulder rest frees the hands for other tasks, and this is most valuable to the one-handed. The person with severe spasticity or ataxia who can place the shoulder rest in position on the shoulder may be enabled to use a handset.

Disadvantages.

A shoulder rest cannot be used by the many persons on whose shoulders it will not stay—it seems to fit chiefly those with long necks—nor can it be used if the projecting parts, or its added weight, make picking up the handset difficult. It is not suitable where there is any significant paralysis of the neck and shoulder girdle, in the presence of joint restriction or pain from arthritis of the cervical spine or shoulder, where muscle spasms occur, or where muscles are tender.

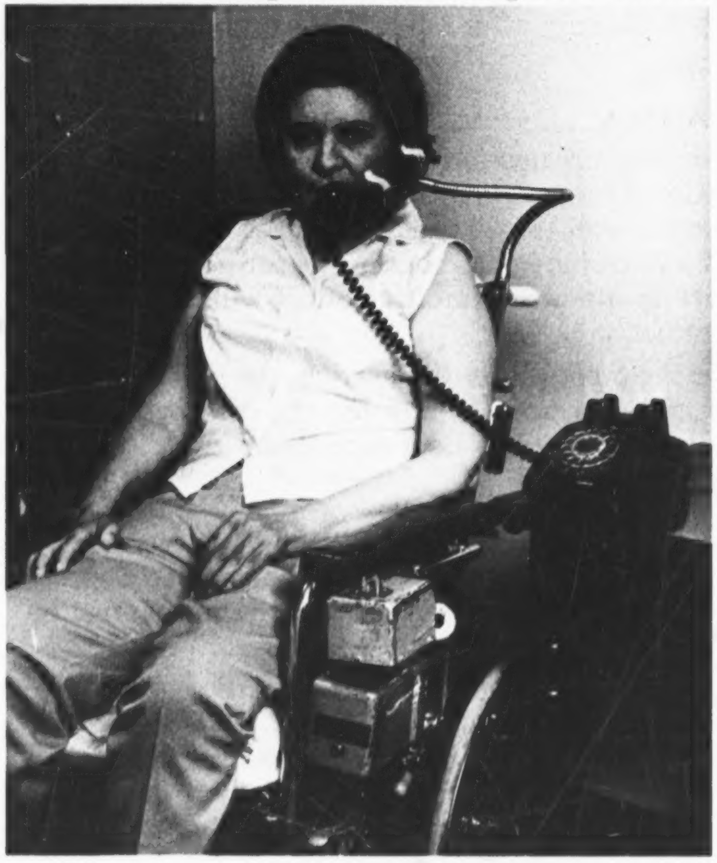
Gooseneck Arm With Spring Clamp *(not commercially available)*

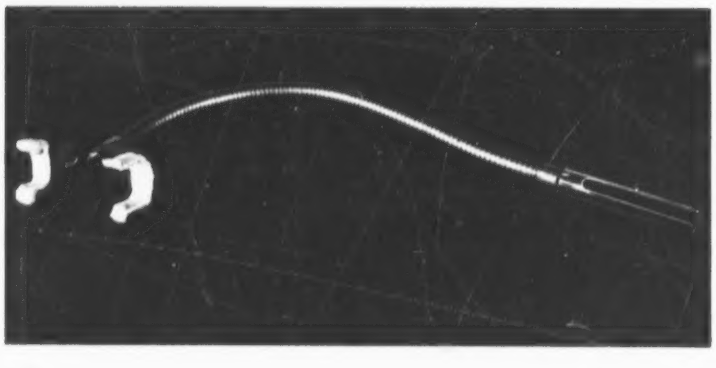
Description.

The disabled person using "hands-free" equipment may not always wish to return to his own special telephone when a call comes for him over another telephone. If he cannot hold a standard handset to his ear, another person must stand by to hold it for him.

This gooseneck arm with spring clamp is designed for such temporary use. It is placed as needed in the headrest socket of the wheelchair frame and allows the handset of any telephone to be placed into it.

The clamp is secured to the gooseneck by a spring-loaded nut. This permits the clamp to be swiveled





on the gooseneck for fine adjustments in the orientation of the handset. The headrest socket in the wheelchair has a bolt protruding into the interior. The tubular end of the gooseneck is keyed to fit over this.

It is essential that the tube does not rotate in the socket. The tube must be a snug fit and the keyway only as wide as the protruding bolt.

Dials and Dialing Arrangements

TOUCH-TONE® DIAL

Description.

The dial consists of a 1¾ in. by 2½ in. bank of 10 or 12 pushbuttons, each ⅜ in. square, slightly concave and angled toward the user. The buttons are gray and the numerals white. This unit is used in all Touch-Tone telephones. The inclination of the dial from the horizontal depends upon its mounting: desk telephone, 30°; separately housed dial, 15°.

It should be noted that Touch-Tone calling is available only after a telephone exchange is wired for it.

Operation.

The pressure necessary to operate the buttons falls within a range of 6 to 10 oz. Each button produces two musical tones, the frequencies of which operate electronic equipment in the central office. Two buttons pressed simultaneously will not select a number.

For the most efficient operation, the dial should be positioned appropriately for the disabled person (see "Positioning the Touch-Tone Dial," p. 88).

Dialing Tool.

A pencil, attached to the hand by a universal cuff (see p. 47) if necessary, may be used to depress the buttons where a finger or thumb cannot be used.

Special Assembly.

The person able to exert pressure, but not on one button at a time, may be aided by a device for calling Operator.

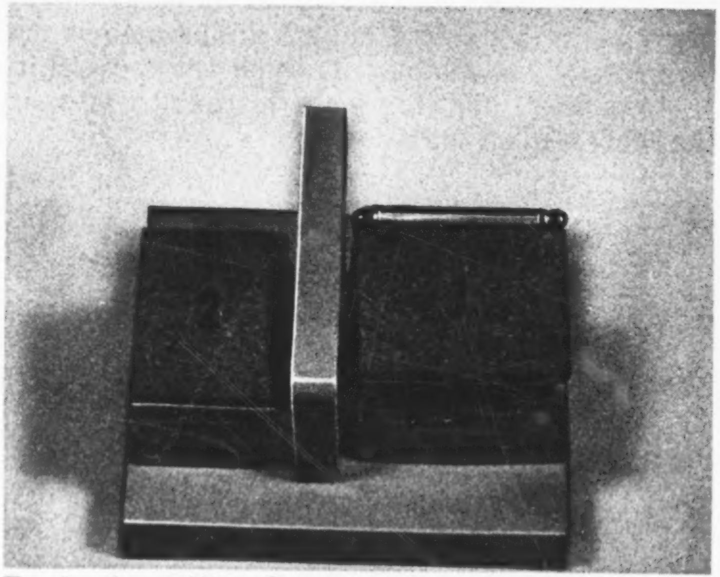
Remarks.

Advantages.

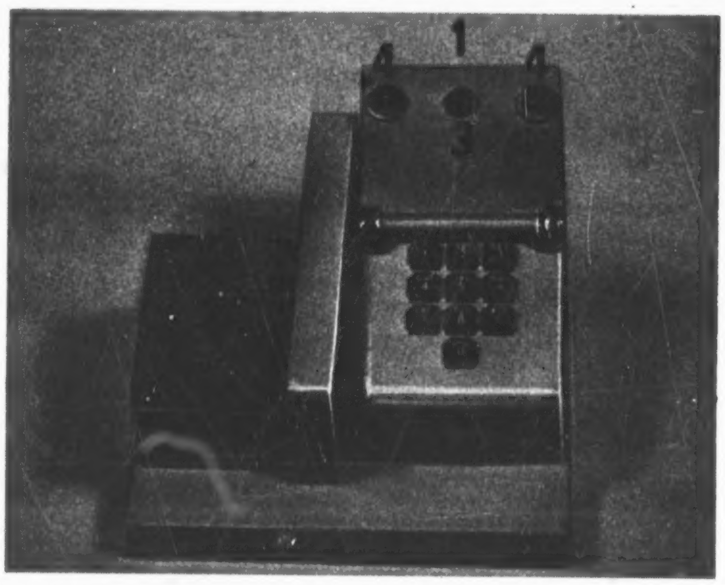
The movement is a simple push and relaxation, but more strength is necessary than for the rotary dial. For those able to exert this pressure, the Touch-Tone dial is excellent.

The person lacking control in his arm does better with the Touch-Tone than the rotary dial, particularly if he rests the palm of his hand on the telephone set, or his wrist on the desk, to eliminate extraneous arm motion.

Touch-Tone dial.



Device for calling Operator. Pressure on the cover plate (1) will dial "O", as noted below. (At left (2) is a chin-switch modified for operation by hand).



Lifting the cover plate (1) provides normal access to the dial. Note: The center knob (3) depresses "0", while pressure on the other buttons is prevented by the outer knobs (4).

One who uses a mouthstick will find the Touch-Tone dial excellent.

Disadvantages.

The letters and numbers on the buttons are white on gray, an insufficient contrast for those with visual difficulties.

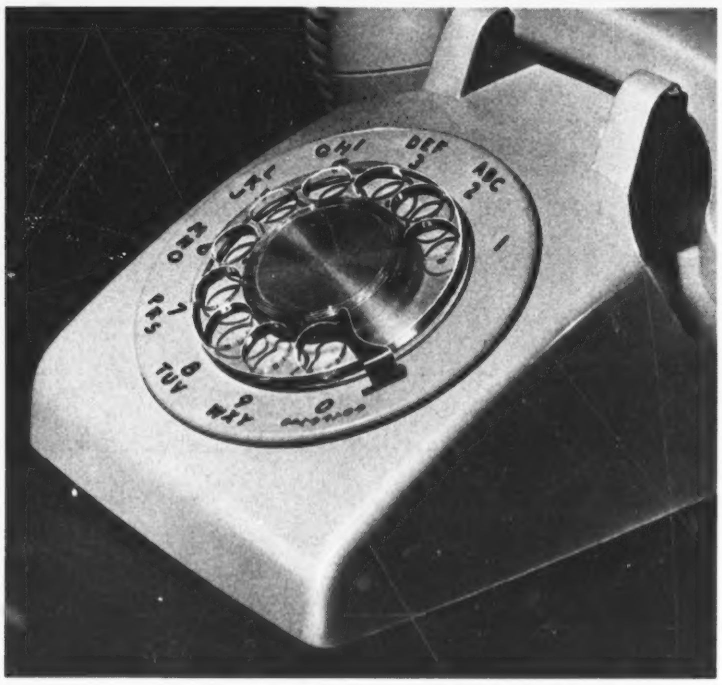
Older persons may have difficulty in adapting themselves to using a new method of dialing.

ROTARY DIALS

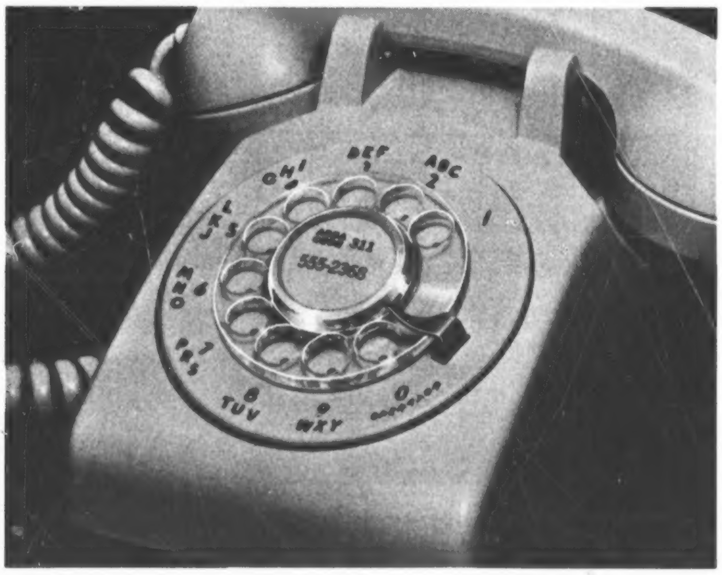
7-Type Dial *9-Type Dial*

Description.

Both the 7-type and 9-type dials have plastic finger-wheels. They may be identified by the finger-wheel: the surface of the 9-type finger-wheel is flat, while the 7-type has a raised ridge around the edge of the station number card. The dials are interchangeable and identification is important since the 9-type dial is significantly easier to move and is the rotary dial of choice. The letters and numbers of the dial are placed around its edge on the dial number plate. The inclination of the dial from the horizontal varies according to its mounting: desk telephone, 26°; separately housed dial, 15°.



9-type dial, identified by its flat finger-wheel.



7-type dial, identified by the ridged finger-wheel.

Operation.

The 9-type dial rotates clockwise, the pressure to move it falling within a range of 2 to 6 oz.

The numbers dialed register on the return of the dial. The number has to be dialed within a certain number of seconds, depending on the equipment and serving central office (see p. 77).

Dialing Tool.

Either the "ball" dialer or the "grooved-knob" dialer may be employed when the finger or thumb cannot be used.

A commercially available universal cuff may be used to secure the dialer in the hand. (Dialing Tools and Cuff, to follow.)

Related Telephones.

Desk and wall sets but excluding the Princess and hanging hand telephones.

Remarks.

The ability to use a rotary dial can depend on positioning it to correspond with the disabled person's movements. (See "Positioning the Rotary Dial," p. 103.)

SEPARATELY HOUSED DIALS

Rotary Dial (1008B)

Touch-Tone Dial (1025A3)

Description.

These dials are small and separated from a telephone set. The height of the finger-wheel (or buttons) above the surface of the desk or table on which the unit stands is less than the height of a dial mounted in a telephone set, and the inclinations are flatter.

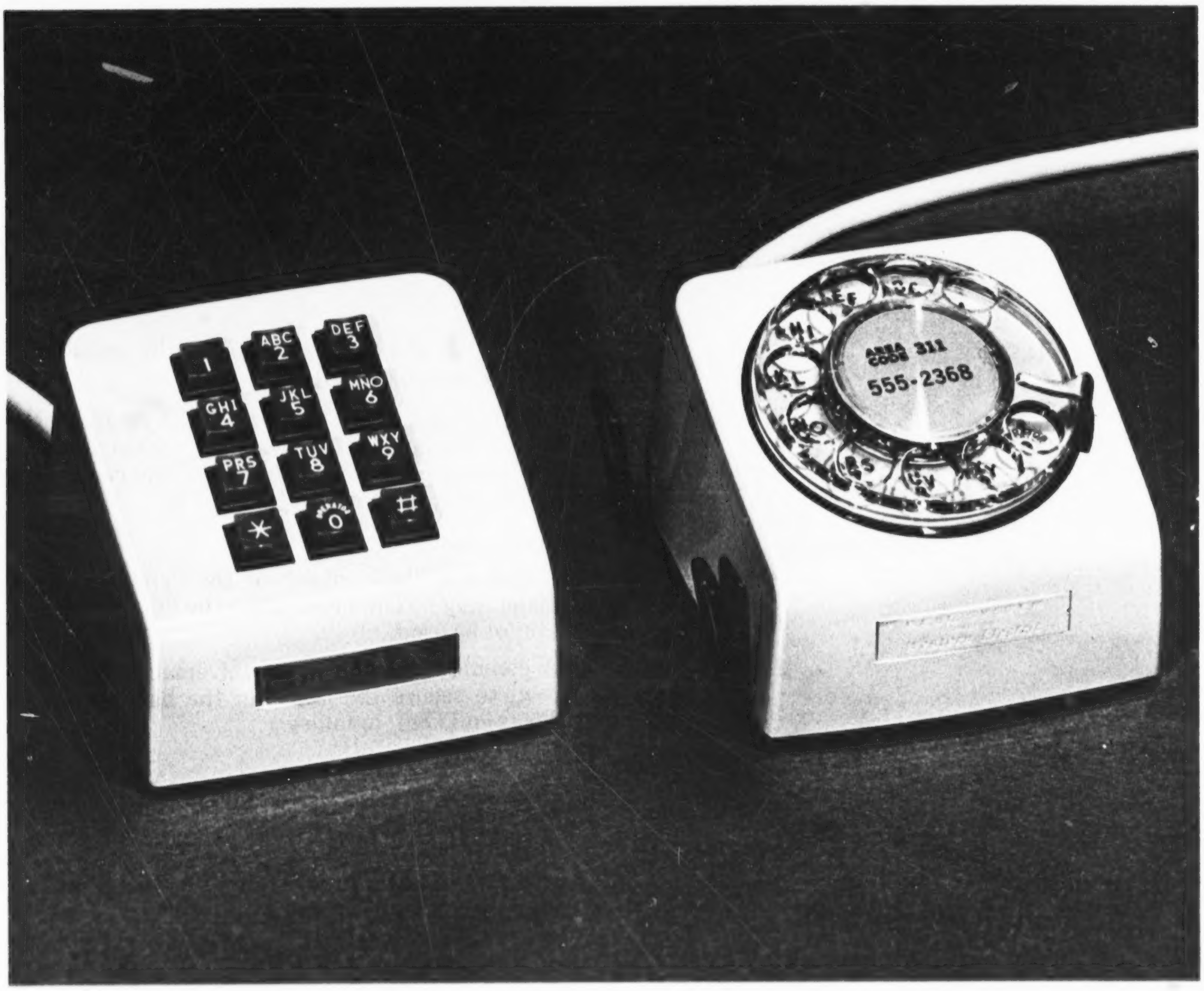
Operation.

Rotary Dial

A 9-type dial, inclined at an angle of 15° from the horizontal, taking 6 to 10 oz. to move.

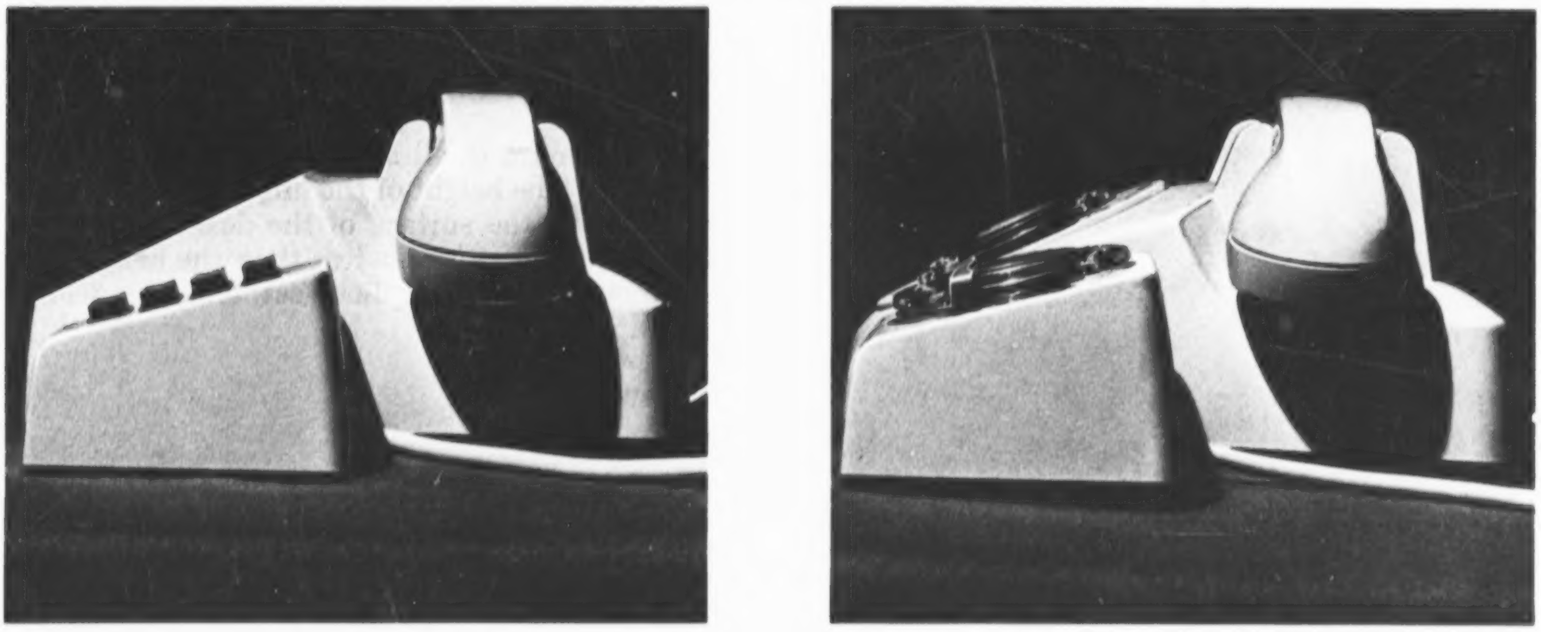
Touch-Tone Dial

See Touch-Tone dial. Inclination from the horizontal, 15°.


ABC 2
DEF 3
GHI 4
JKL 5
MNO 6
PRS 7
TUV 8
WXY 9
OPERATOR 0
AREA CODE 311
555-2368

Separately housed dials. Touch-Tone dial. 1008B rotary dial.

Comparison of the dial in a desk set and the separately housed dials.



Desk set: 30°. Separately housed dial: 15°.

Desk set: 26°. Separately housed dial: 15°.

Related Telephones.

4A key equipment. A separately housed dial may substitute for the desk telephone of the Speakerphone system.

Remarks.

Advantages.

A separate dial enables the components of a telephone to be placed to correspond with the user's greatest function or to conserve space in the work area. The lesser weight of the separately housed dial, compared with a desk telephone, allows the dial to be moved within reach as necessary.

The low height of either finger-wheel or buttons is an advantage to the user requiring a low position of the dial.

Rotary Dial

The inclination of the separately housed dial is less than that of a desk set, making it easier for the severely disabled person to use.

Touch-Tone Dial

When the thumb is used to dial, the small size and shape of the housing does not obstruct the fingers as can the wider housing and the cradle posts of the standard desk telephone.

Disadvantages.

Rotary Dial

The dial unit can move during use due to its light weight, especially if it is on a highly polished surface. (Although this can be prevented by placing it on a thin piece of rubber, the user will no longer be able to move the dial toward him.)

CARD DIALER

Rotary Dial—9-Type *Touch-Tone Dial*

Description.

A large desk telephone set for repertory dialing. The cards for dialing are housed at the back, and the insertion slot is in front of them, together with, in the rotary dial model, two rectangular bars for "start" or "release." The Touch-Tone dial model has one bar for "start." A dial is provided for manual dialing and the handset rests flat on a handset hanger to the left side of the instrument. All faceplates are gray, and the dial numerals are white on gray. The card storage bin on the set holds 40 cards. Additional dialing and index cards are available at an additional charge. Pressure required to depress the card into the slot is about 1 lb. 12 oz.; pressure for the "start" and "release" bars, about 11 oz.

Available also with headset jack; as 6-button set; as 6-button set with headset jack.

Operation.

A card is prepared with a telephone number by punching out the appropriate holes, labeling it for identification, and storing it with the others in alphabetical order. To use a card, it is placed in the slot, pushed down, and the dialing started by pressing the "start" bar. The card emerges up from the slot as dialing proceeds. On the rotary dial model the "release" bar is used to release the card at the end of the call. No release bar is provided on the Touch-Tone model; pushing the "start" bar will bring up the card for removal.

The card may be initially difficult to push down into the slot—a sharp slap on its top may be used by those unable to sustain a steady pressure.

When the number to be called has not been recorded on a card, the dial is used manually in the normal fashion.

Modifications.

The slot may be painted a distinctive color to stand out from its background for those who have difficulty in seeing or judging its position.

A special assembly card guide may be added. This is helpful to all who have difficulty inserting the card in the slot.

Remarks.

Advantages.

Instead of the seven movements of the dial, dialing consists of placing the card in the slot, pushing it down, and pressing a bar. If this can be done, the chance of error is negligible. If desired, an appropriate card may be left in the slot ready for use. This may be a card that will dial "operator" so that the disabled person can ask for the number.

Neuromuscular Incoordination*

Useful only if a card can be fully depressed. The disabled person must either be able to place a card in the slot or, if a card for "operator" is used, be able to ask for the number.

Difficulty in recognition of numbers*

The cards are themselves an easily read directory. When names cannot be recognized, photographs may be used for identifying the cards (see p. 71).

Impaired sight or confusion

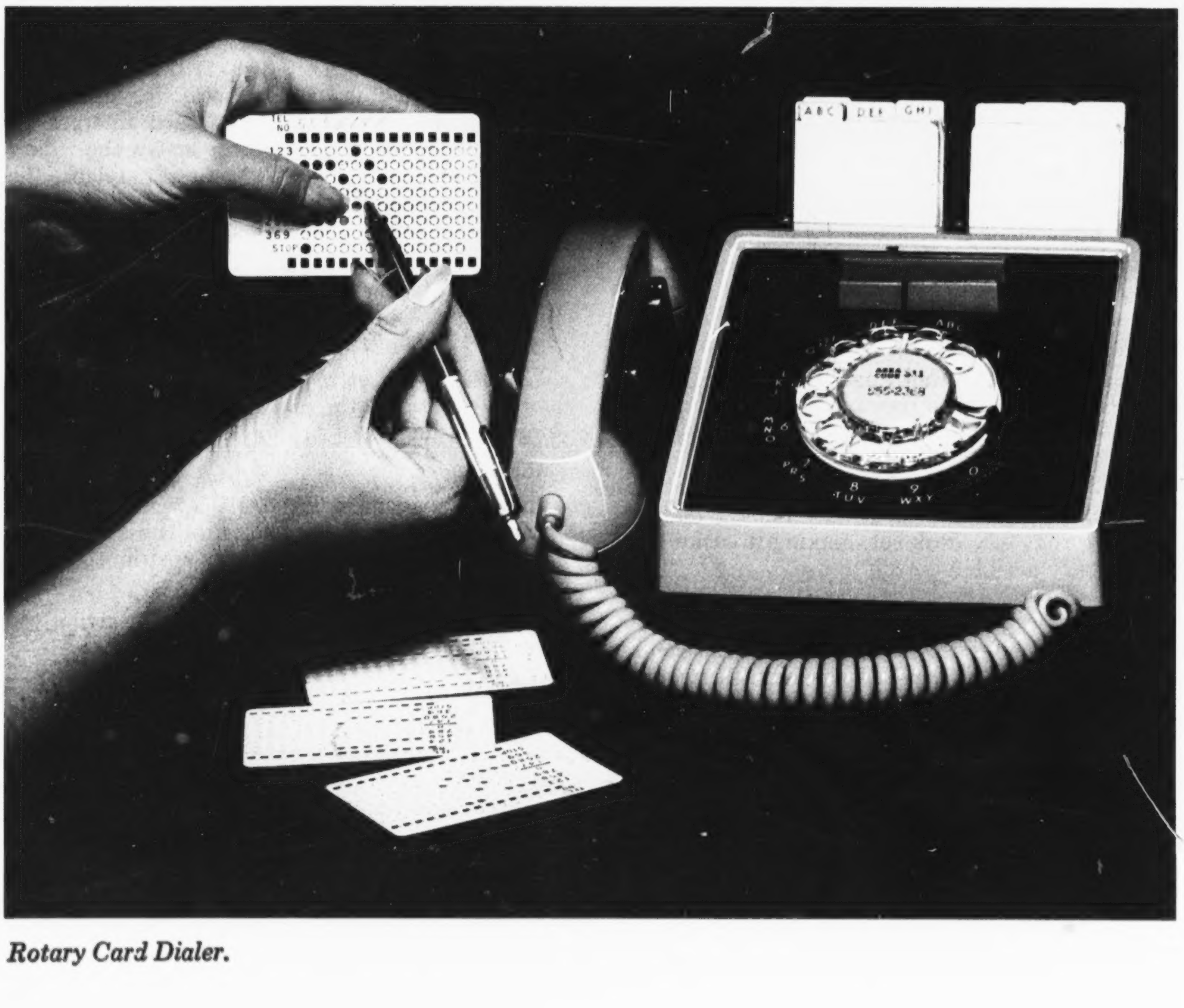
Excellent for the elderly or confused who cannot manage all seven numbers with accuracy. Adhesive braille tape may be used on the cards where appropriate.

Perceptual deficit*

A Card Dialer may be of assistance to the person who has lost the ability to follow the sequence of seven numbers—provided that the person can align the card with the slot or, when a card for "operator" is left ready, can ask for the desired number.

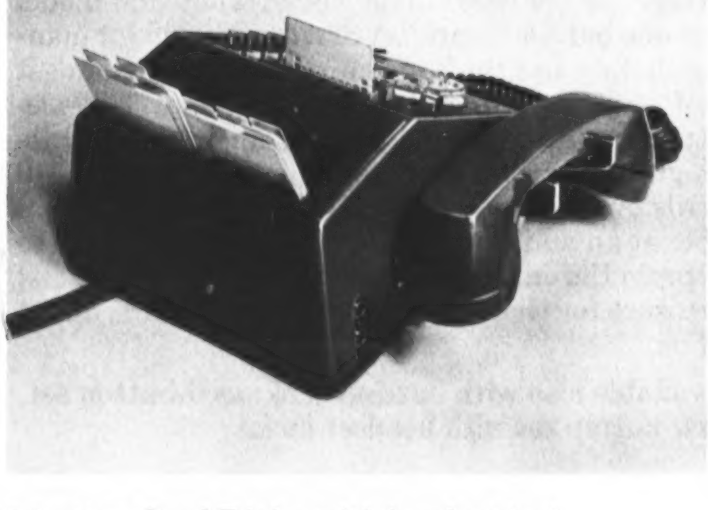
---

*For a full description of use of the Card Dialer, see "Procedure for Testing the Card Dialer" p. 105.

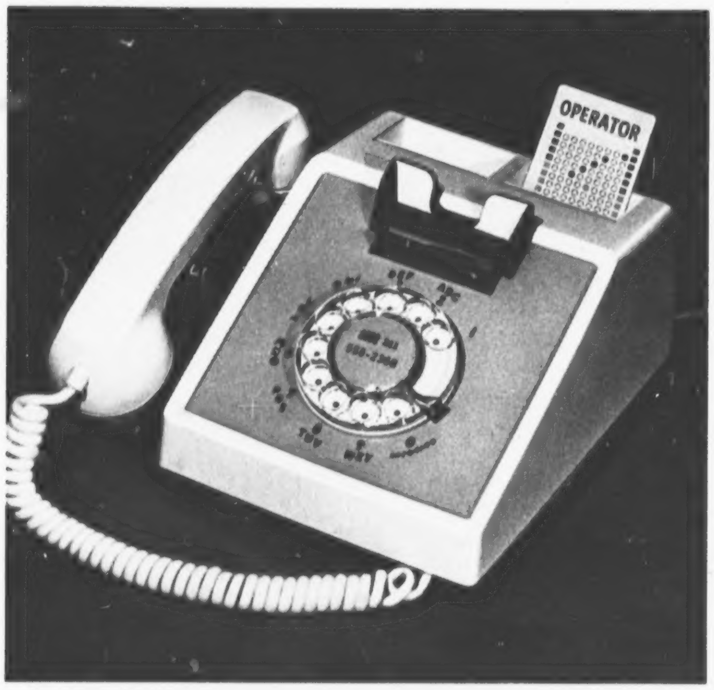


Rotary Card Dialer.

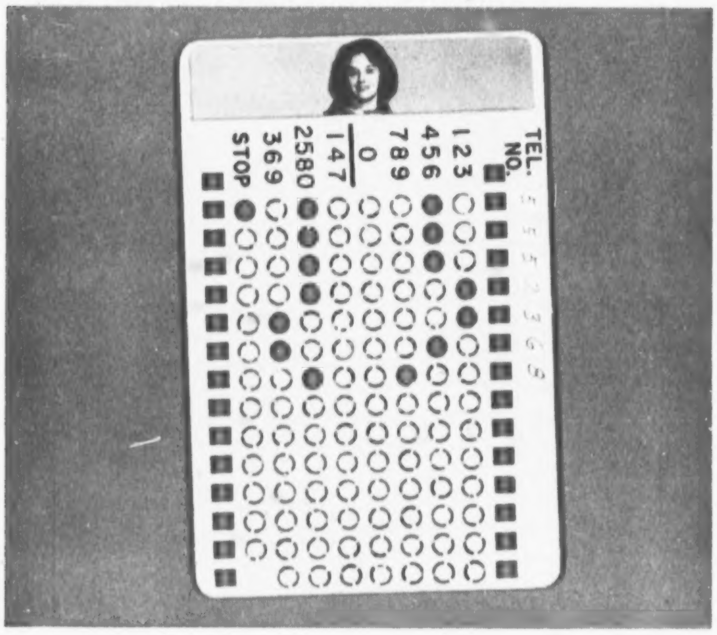
Touch-Tone Card Dialer.



6-button Card Dialer with headset jack.



Card Dialer equipped with card guide.



Card identified by photograph.

Cards identified by adhesive-backed braille tape.

Safety factor

It can provide a safety factor to those persons who must be left alone in the house and whose difficulty in dialing could be magnified by the stress of an emergency.

Disadvantages.

Those with loss of muscle strength or joint range of motion do not find that the motions involved in using a card provide an advantage over a manual dial. In addition, for many persons the pressure of up to 1 lb. 12 oz. for depressing a card may be too great. However, if the user has occasion to call the same numbers many times, as in some types of business, it can be very helpful.

NOTE: In the event of a power failure, the desk telephone can be used but the Card Dialer portion of the set will become inoperative.

MAGICALL

Magnetic tape repertory dialers, such as the Magicall, are offered by the various Bell operating companies. The local Telephone Company should be contacted to find the operating features of the type available in its area.

Description.

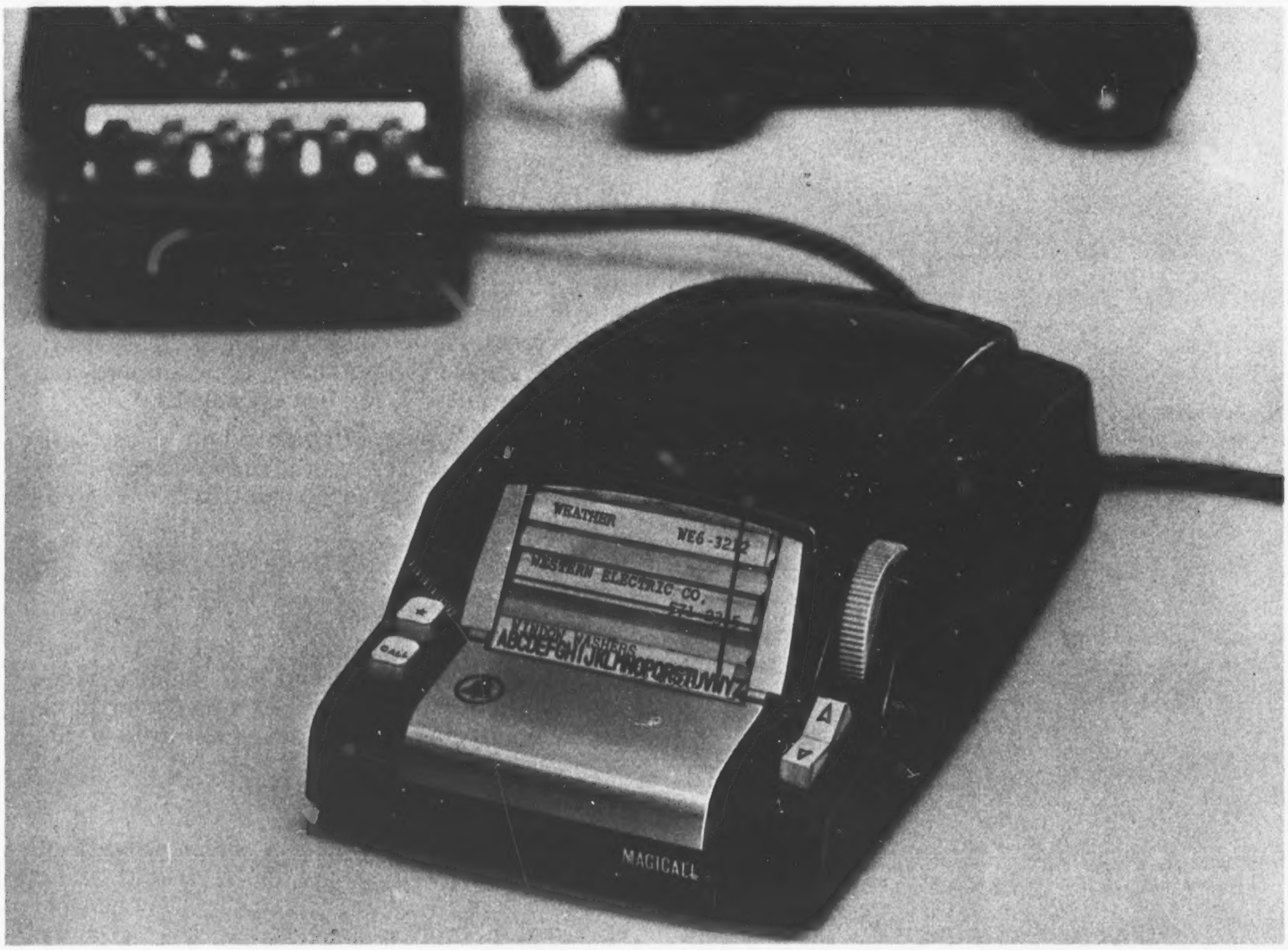
This magnetic tape repertory dialer consists of wall-mounted power supply, repertory unit, and a separate desk (or other) telephone. An independent "dial-in" unit is plugged into the repertory at the time of recording a number.

Operation.

Telephone numbers are recorded on a movable magnetic tape and the identifying names are written in alphabetical order on a paper covering the tape. The front of the repertory has a window with two parallel lines, and the tape is moved to bring the identifying name between these lines. Pressure on the "call" button then places the call.

The tape is moved by a fast-selector and a fine-selector. Fast selecting is achieved by pressure on a rocker pushbutton: pressure downward and away causes a motor to turn the tape drum in one direction; pressure downward and toward the user reverses it. A red line on the tape moves along an alphabetical index at the bottom of the window. During use of the fast-selector, this tells the user where he is located on the tape. Final adjustment to bring the name between the lines is achieved by pressure from a finger on the fine-selector wheel, whose serrated edge points upright. The mechanism includes a clutch, so that to move the wheel, it has first to be pushed downward by its edge, and this pressure must be maintained while turning the wheel.

Use of the "dial-in" unit for recording numbers on the tape requires good hand and arm function.



Magicall. On left side of set—"record" button and "call" button. On right side of set—fine-selector wheel and fast-selector button.

Related Telephones.

The Magicall may be used with any telephone.

Modification.

Levers may be attached to the "call" and fast-selector buttons to reduce the force necessary for their operation.

Remarks.

Advantages.

The Magicall is very helpful in operating a business and may be used for this purpose by the disabled person able to operate its controls.

Disadvantages.

The controls are too resistive to offer an advantage to one with less than good muscle strength in the hand and arm.

The selector button and wheel require the user to have adequate control in his arm for the identifying name to be brought accurately between the lines.

DIALING TOOLS *(commercially available)*

"Ball" Dialer

Description.

Available on a 5-inch mechanical pencil (through the Bell System) or as a short slip-on attachment for use on the end of a pencil (through stationery stores). The "ball" dialer ends in a freely rotating ball designed to eliminate friction during use on the rotary dial.

Operation.

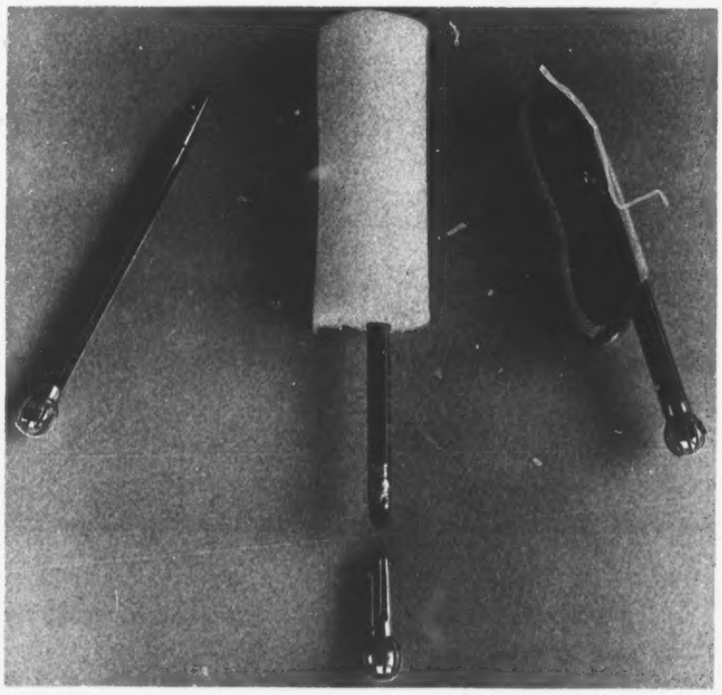
The "ball" dialer requires a downward pressure to maintain it in the hole, and a secure anchorage in the hand.

A "ball" dialer can accommodate changes of angle between arm and dial during dialing and for this reason it may be particularly useful when the dial faces in directions other than toward the operating arm.

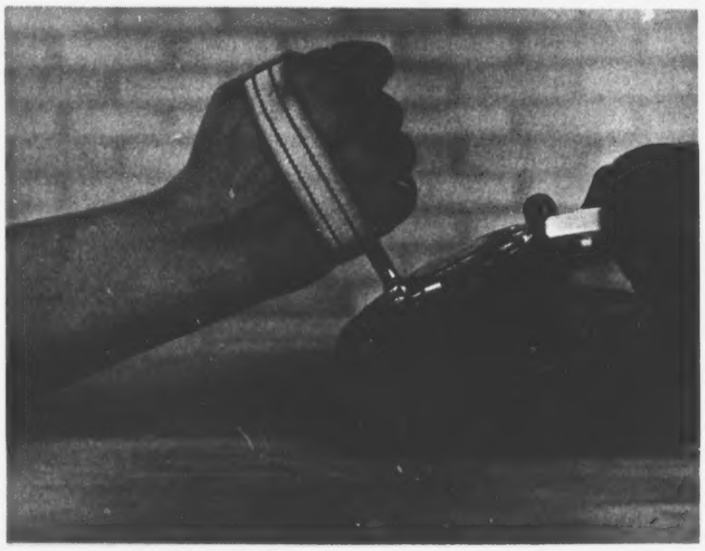
The arc of movement necessary for the use of a "ball" dialer is small. It is a helpful substitute for the finger where joint destruction has occurred and the hand is painful.

When loss of hand function prevents the use of the fingers for grasping, an elastic cuff may be placed over the palm for devices to be placed in its pocket. *(Illustrated pp. 45, 46.)*

The advantage of the short slip-on attachment is that it allows variation of the length of a rod between hand and ball. This rod should be long enough for the person to see the ball and to let him use the weight of his arm as necessary for leverage, but short enough for him to have maximum control of its movement.

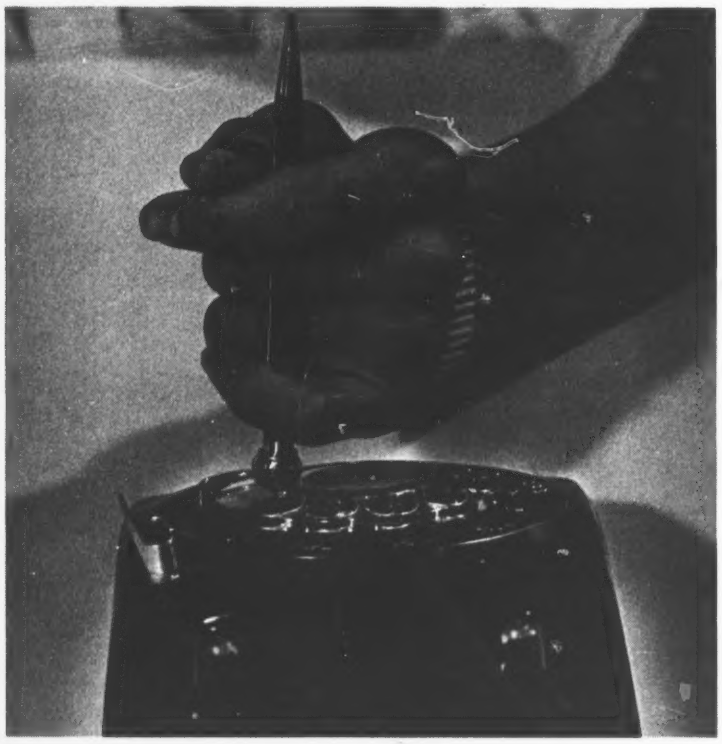


"Ball" dialing tool. Left—Bell System dialing tool. Center—pencil padded with sponge rubber and short "ball" attachment. Right—"ball" dialing tool in universal cuff.



Use of "ball" dialer in universal cuff.

Use of a padded "ball" dialer by both hands.



A method of securely grasping a dialer.

Modifications.

Padded Dialer

When the disabled person does not have a secure enough grip to prevent the "ball" dialer from being dislodged from his grasp, the dialer may be padded with foam rubber. A padded dialer is suitable for use when the grip of one hand is insufficient: The cylinder is held in one hand and the fingers are held closed by the palm of the other hand. Good trunk balance is necessary for using both hands in this way for dialing.

Padding a dialer can also be helpful when it is to be held across the palm (as in a stabbing position) and when it is painful to grip a thin object with the fingers.

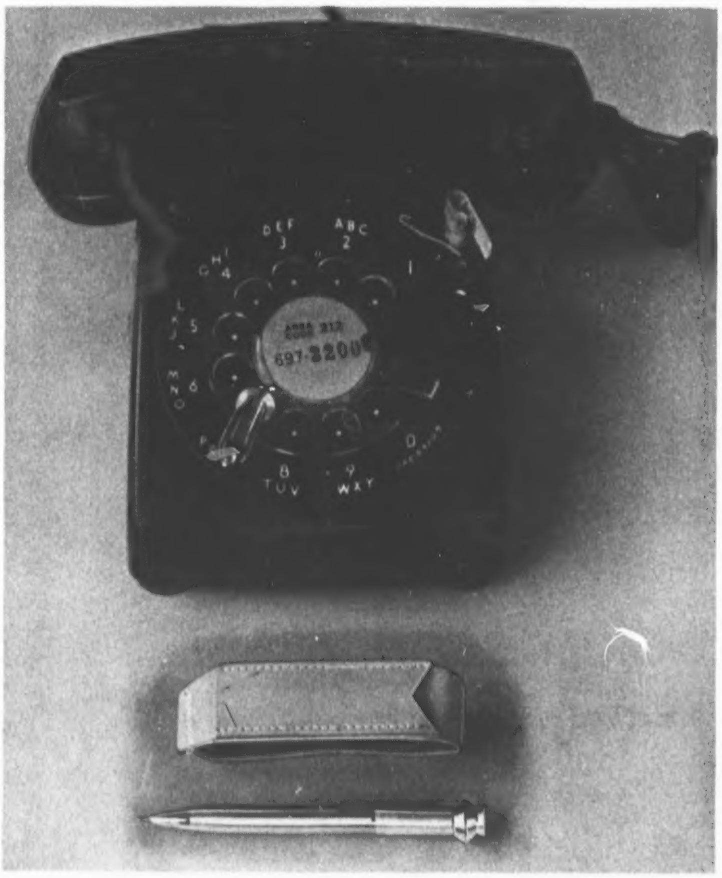
"Grooved-Knob" Dialer

Description.

Available from stationery stores on a short (4 in.) ballpoint pen, ending in a solid ball with a groove and flange. Used on rotary dials.

Operation.

The greatest use of a "grooved-knob" dialer is for those unable to press downward sufficiently to maintain a dialer in the hole while moving the dial.



"Grooved-knob" dialing tool lodged in the finger-wheel.

Below, a universal cuff, "grooved-knob" dialing tool.

The "grooved-knob" dialer is positioned to point in the direction it will be moved.

The "grooved-knob" dialer is then used as post in turning the finger-wheel.

When the dialer is placed in a hole of the dial finger-wheel and allowed to tilt, the flange catches the underside of the rim and will remain in place. It does not accommodate a change in its angle between hand and dial finger-wheel greater than 35° without jamming, and if used with force by one unable to control his movements, it will break the finger-wheel.

When hand function is entirely lacking, the "grooved-knob" dialer may be secured to the hand by a universal cuff. The "grooved-knob" dialer may not be suitable for the person unable to follow the upward inclination of the dial.

Operated by Circumduction at the Wrist.

When the arm has little movement but the wrist function is good, a special technique may be employed. The dialer is placed upright in the appropriate hole and is used as a post to be pushed around to the stop. Pressure on its side is removed and the dial allowed to return to normal, carrying the dialer. The dialer is moved to the next hole and the procedure repeated for all the digits to be dialed.

The ability to grasp the dialer between fingers and thumb to move it from one hole to another is not necessary when it can be held between two extended fingers.

When the dialer is placed in the hole, it should be allowed to come to rest lodging in position. Before attempting to use it to move the dial, pressure should be put on one side of the shaft, moving it to point toward the direction in which it will be moved. This action should have securely lodged the dialer, and further pressure may now be applied to move the dial finger-wheel. As the dial moves through each arc, pressure in the appropriate direction must be maintained.

When learning this technique, it is advisable for the person to begin at a hole at the top of the dial, where little change of direction is necessary, before attempting the higher numbers, and to spend time in unhurried practice to acquire the skill.

It will be noted that the tip of the dialer moves through an arc larger than the circumference of the dial. Greater range of motion, therefore, is needed for operating the "grooved-knob" dialer in this manner than in holding it with the fingers or in employing a "ball" dialer.

Use of this special technique is particularly appropriate for the person with muscular dystrophy.

Universal Cuff

Description.

When loss of hand function prevents the use of the fingers for grasping, an elastic cuff may be placed over the palm for devices to be placed in its pocket.

When the pocket is open at both ends, one end should be stapled closed. Either a pencil or dialing tool may be placed in the pocket, pointing across out of the hand by the thumb, or more frequently, out by the little finger.

Source.

G. E. Miller Inc.
484 South Broadway
Yonkers, New York
10705
leather and elastic cuff, in three sizes

B/K Sales Co.
Box 32
Brookfield, Ill. 60513
leather and Velcro cuff, in three sizes

Coin and Dialing Sticks *(not commercially available)*

Description.

The person unable to reach the coin slot and dial of a coin telephone may use an angled stick for this purpose. Refer to "Coin Telephones" pp. 137, 138 and equipment drawings, pp. 56, 57.

Telephones for Special Situations

AUTOMATIC ANSWERING AND RECORDING SETS

Description.

Several types of answering sets are available for the person who does not wish to miss any calls when away from his telephone. One type of set will repeat a pre-recorded message to the caller; another type is able, in addition, to record a message that the caller may wish to leave. Details may be obtained from the local Telephone Company.

CALL DIRECTOR

Rotary dial *Touch-Tone Dial*

Description.

A Call Director is a large telephone set for office use. It is used for centralized answering of up to 29 lines, and for transfer of calls through an intercom line. Available with headset jack.

Special assembly.

A Seeing-Aid photo-electric probe may be used by a blind person to identify which line buttons are lighted. *(See next page.)*

Call Director

SWITCHBOARDS

Description.

Various types of switchboards are used by enterprises having from a few dozen to many thousands of telephone extensions. Depending upon the number of extensions and the amount of telephoning activity, switchboards may be of the single-position or multiple-position type. During periods of peak activity, there will usually be an attendant assigned to each position of a multiple-position board. When traffic is lightest, perhaps only a single position may be manned.

Cord-type switchboard in use.

A switchboard has a horizontal key shelf and a vertical face, the latter containing many rows of sockets called "jacks." Plugs, which rest on the key shelf, are on the ends of long flexible cords that hang below the shelf. The attendant selects the appropriate plug, raises it against the resistance of a counterweight on the cord, and plugs it into a jack to establish a connection to an extension. She also has to operate pushbuttons or lever-type keys on the key shelf. A dial on the shelf at each position is used for making outgoing calls.

Supplemental equipment.

A small transistorized amplifier that plugs into the headset jacks is available for the attendant with impaired hearing.

For the blind attendant there is a Seeing Aid photo-electric probe that enables her to ascertain which signal lamps on the board are lighted (lamps light whenever action by the attendant is required). Experience has shown that blind attendants function more effectively at single-position boards where traffic is consistently light. If it is desired to give employment to a blind attendant at a multiple-position board, this can be done successfully by equipping one position with the Seeing Aid probe and scheduling the blind person for light traffic periods when only a single attendant is needed.

CONSOLES

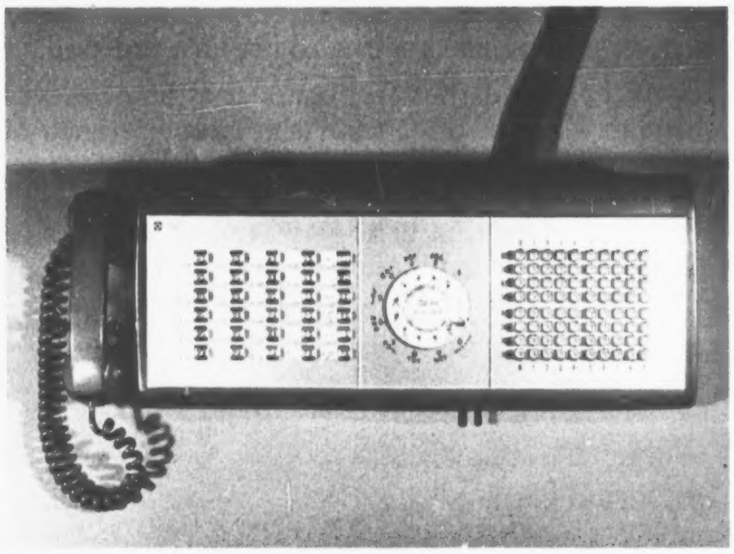
Description.

A telephone console has a sloping panel with a dial and rows of pushbuttons. Connections to outside lines are established by pushing buttons (instead of putting plugs into jacks as on a switchboard). Extension connections are established by pushing buttons or by dialing, depending on the type of console installation.

Consoles are used by enterprises having from a few dozen to several hundred telephones. In a large installation, several attendants' positions, each with a console, may be provided.

If a console is equipped with a Touch-Tone dial, the attendant performs all operations solely by depressing buttons. If there is a rotary dial, dialing a number is the only operation which does not involve pushing buttons.

If extension connections are to be established by pushing buttons, and if there are many extensions, the console may be provided in two separate sections placed side-by-side, rather than as a single unit.



A small console-type switchboard. Left—pushbuttons for incoming calls. Right—pushbuttons for extensions.

Supplemental equipment.

There is no headset amplifier available for a hard-of-hearing attendant. A Seeing Aid photo-electric probe is available for blind console attendants.

In a multiple-position console installation, incoming calls are distributed automatically to each of the manned positions on a first come, first served, basis. With this arrangement, a blind attendant can work at her own pace alongside sighted attendants.

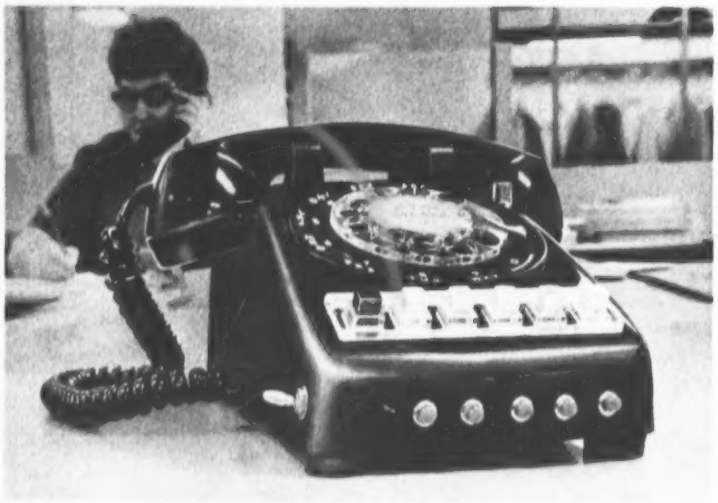
EQUIPMENT FOR THE BLIND

A discussion of the use of the telephone by the blind is given on p. 111.

6-BUTTON TELEPHONE SPECIAL ASSEMBLY

Description.

A special assembly is available that allows a blind



6-button set modified for use by the blind.

person to identify which line is ringing on a 6-button telephone.

The modified instrument has a row of test buttons in front of the regular line buttons. The user holds the handset to his ear and pushes each button in turn. He will hear a buzz in the receiver that is synchronized with the associated line lamp, giving a steady or intermittent signal to indicate the line condition.

SEEING AID

Description.

A photo-sensitive probe enables a blind switchboard attendant to locate the lighted lamps on a cord- or console-type switchboard, or a Call Director. Refer to "Switchboards" and "Consoles".

A Seeing-Aid probe in use on a switchboard.

EQUIPMENT TO COMPENSATE FOR DEAFNESS

SIGNALLING DEVICES

Description.

A variety of signalling devices is available to attract attention to a ringing phone (*not illustrated*).

A *tone-ringer* concentrates all the sound power in the frequency range where the person's hearing is least impaired.

A *gong* or a *loud-ringing bell* may be utilized by the person who only needs a louder signal.

A *beehive lamp* can be used by those who do not wish to have a loud signal.

An *auxilliary signal control* can be used to switch on any small household appliance, such as a light or a fan, when the phone rings.

IMPAIRED HEARING HANDSET

Description.

A handset with built-in amplifier and volume control wheel provides amplification up to about 25 dB to compensate for slight to moderate hearing loss.

BONE CONDUCTION RECEIVER

Description.

This receiver is for the person with a conductive hearing loss due to middle ear dysfunction. The sound is applied to the mastoid bone and the vibrations are conducted through the bone directly to the inner ear.

Bone conduction receiver.

WATCHCASE RECEIVER

Description.

A watchcase receiver is a monitoring receiver associated with a telephone. The deaf person has an assistant listen to the conversation with this receiver and repeat inaudibly the words of the distant party. The deaf person reads his assistant's lips and replies in the normal manner.

A watchcase receiver in use.

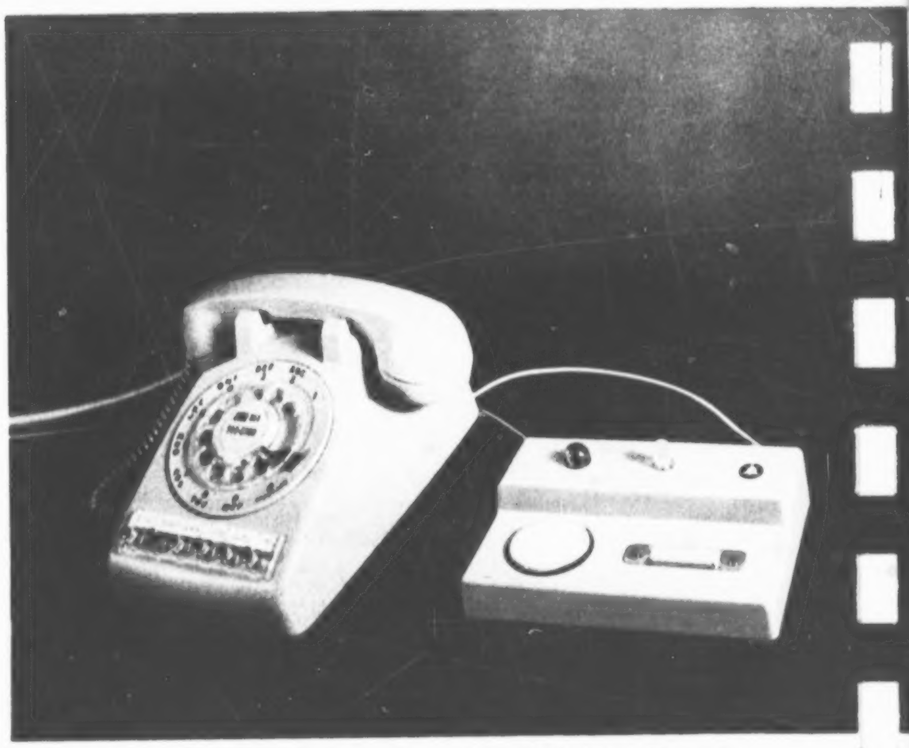
TACTILE-VISUAL SET

Description.

A tactile-visual set is a device to enable people who are totally deaf, or who are deaf and blind, to communicate by telephone. It converts incoming sounds into visual signals (a flashing light) or tactile signals (vibrations of a diaphragm). It allows anyone to communicate with the deaf person from any telephone, and only the deaf person needs the special equipment.

Communication takes place by means of a prearranged code, such as the Morse Code. The sender can whistle, hum, or "bzz" into his handset to generate dots and dashes. The deaf person reads the signals by watching the light or feeling the vibrations with his fingers, and replies in the normal fashion. If he is unable to speak, he can reply by the same method or use the sending button on the tactile-visual set to send a tone to the person calling.

Those who have not mastered a code can communicate in a rudimentary way by utilizing a system of one signal for "yes," two signals for "no," and three signals for "I don't know."



Tactile visual set. Rear—the signal lights. Front left—vibrating diaphragm. Front right—sending button.

TELETYPEWRITER

Description.

A teletypewriter is a form of electric typewriter that can be used for communicating over telephone facilities. When one person types a message on his machine, the identical message is typed as a detachable printout on the distant machine. Both machines must be of a compatible nature. (*Not illustrated.*)

The deaf person may lease teletypewriter exchange service (TWX) from the telephone company or he may elect to use his own teletypewriter machine in connection with DataPhone—Data-Service.

TELEWRITER

Description.

A telewriter is a machine that operates a stylus on a roll of paper. When a message is written or a sketch is drawn with the stylus on one machine, the stylus of a similar machine at the other end of the line reproduces it in facsimile. Connection is made through DataPhone-DataService. Communication is possible only with compatible machines. (*Not illustrated.*)

Telewriters are not furnished by the telephone company. They are purchased or leased from business machine companies.

EQUIPMENT TO COMPENSATE FOR IMPAIRMENT OF THE VOICE

ELECTRONIC LARYNX

Description.

This is a battery-powered, portable device for the

Electronic larynx.

patient who has had a laryngectomy and who is unable to master oesophageal speech.

WEAK SPEECH HANDSET

Description.

This is used by those without adequate voice volume. Its use as a means of conserving breath by speaking softly (for those with a low breath reserve as, for example, in pulmonary emphysema) has not been evaluated.

The amount of amplification is adjustable by means of the control wheel in the handle.

SERVICES FOR THE HOMEBOUND STUDENT

Two systems are available to permit a disabled student to attend school by telephone.

School-to-Home Service allows the temporarily homebound student to participate in his regular classes by means of a loudspeaker and transmitter that are set up in the classroom and in his home. The student's equipment is shown in Fig. 33e, p. 117.

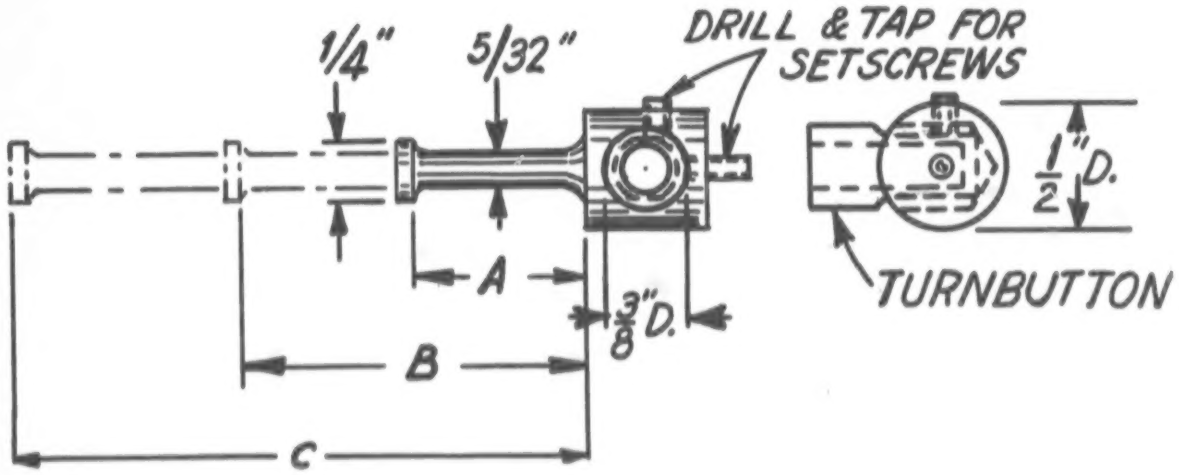
Tele-Class Service is used by a specialized teacher to instruct a class of permanently homebound students.

Volume control handset (Impaired Hearing or Weak Speech).

Equipment Drawings

The equipment drawings illustrate special devices that have been designed to assist the disabled person in some aspects of telephoning. Some of the items illustrated can be provided to the disabled person by the local Telephone Company. In other instances, it may be more convenient for the equipment to be constructed by the resources of the rehabilitation facility. This may be discussed with the Marketing Coordinator of Services for the Handicapped (copies of large-scale engineering drawings may be made available, if requested).

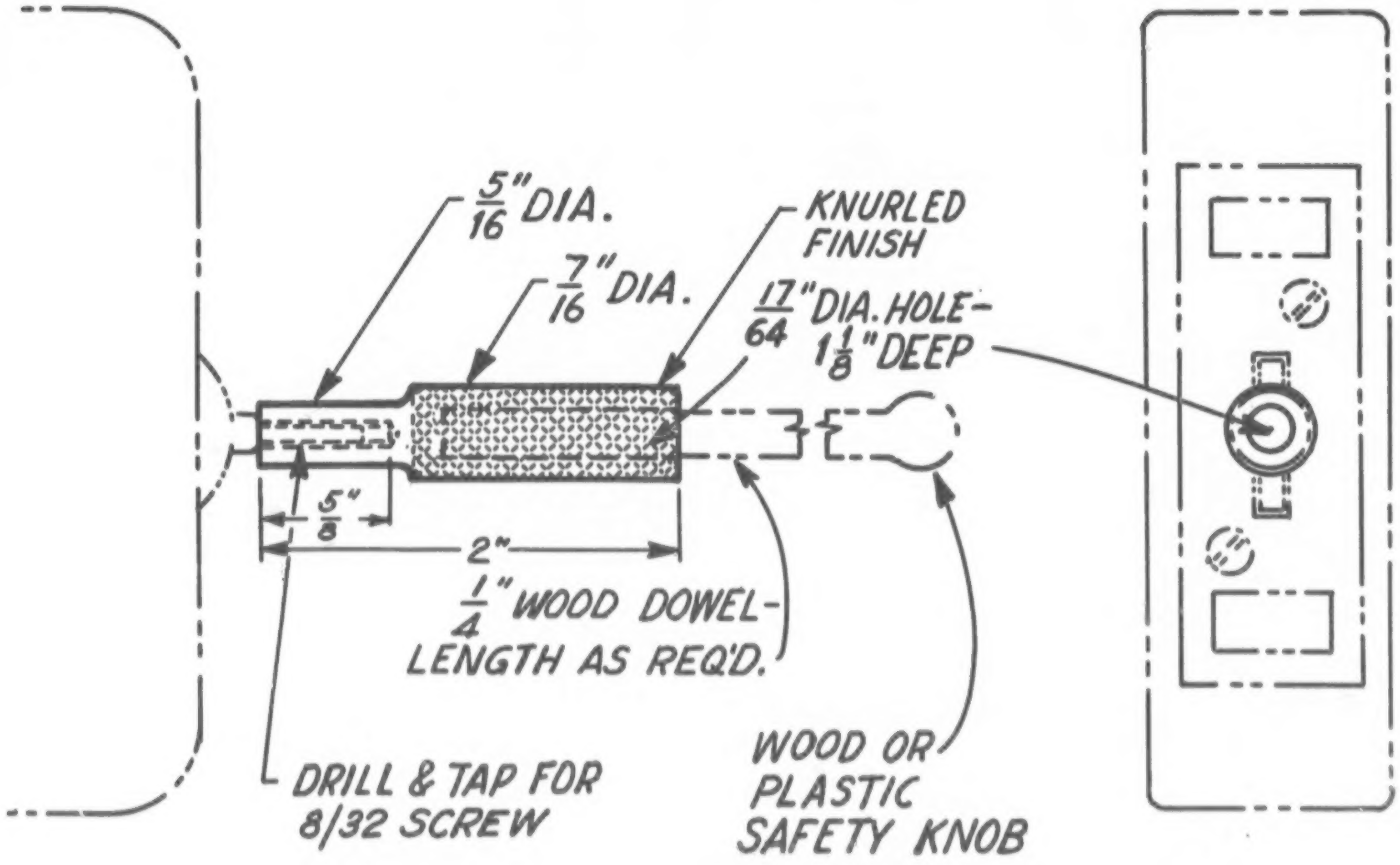
No illustrations are provided for those special assembly items that require a telephone to be disassembled. These must be fitted by the Telephone Company.


1/4"
5/32"
DRILL & TAP FOR SETSCREWS
1/2" D.
TURNBUTTON
A
3/8" D.
B
C

DIMENSION	LENGTH
A	3/4"
B	1-1/2"
C	2-1/2"

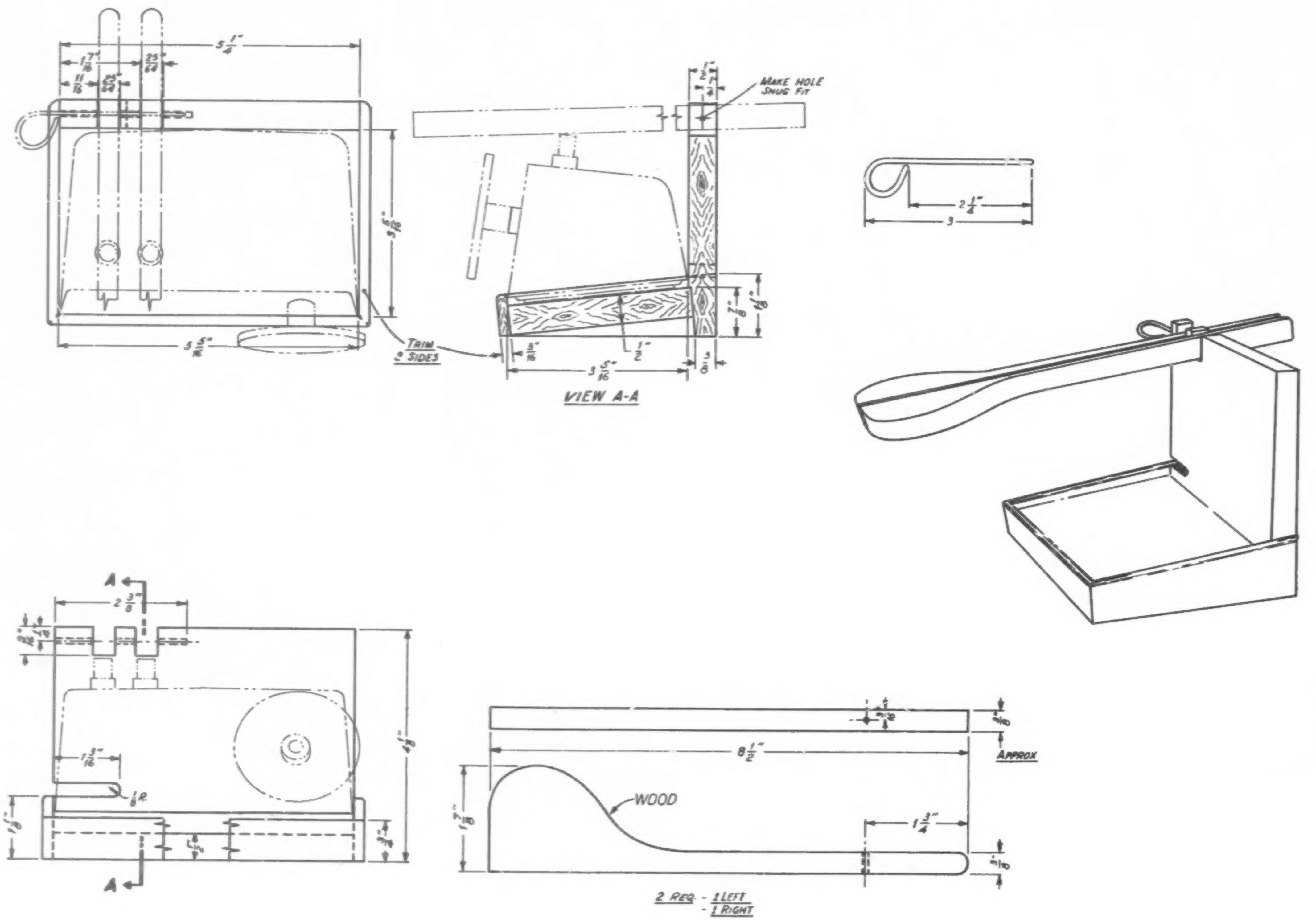
EXTENSION LEVER FOR TURNBUTTONS

MATERIAL: ALUMINUM OR BRASS

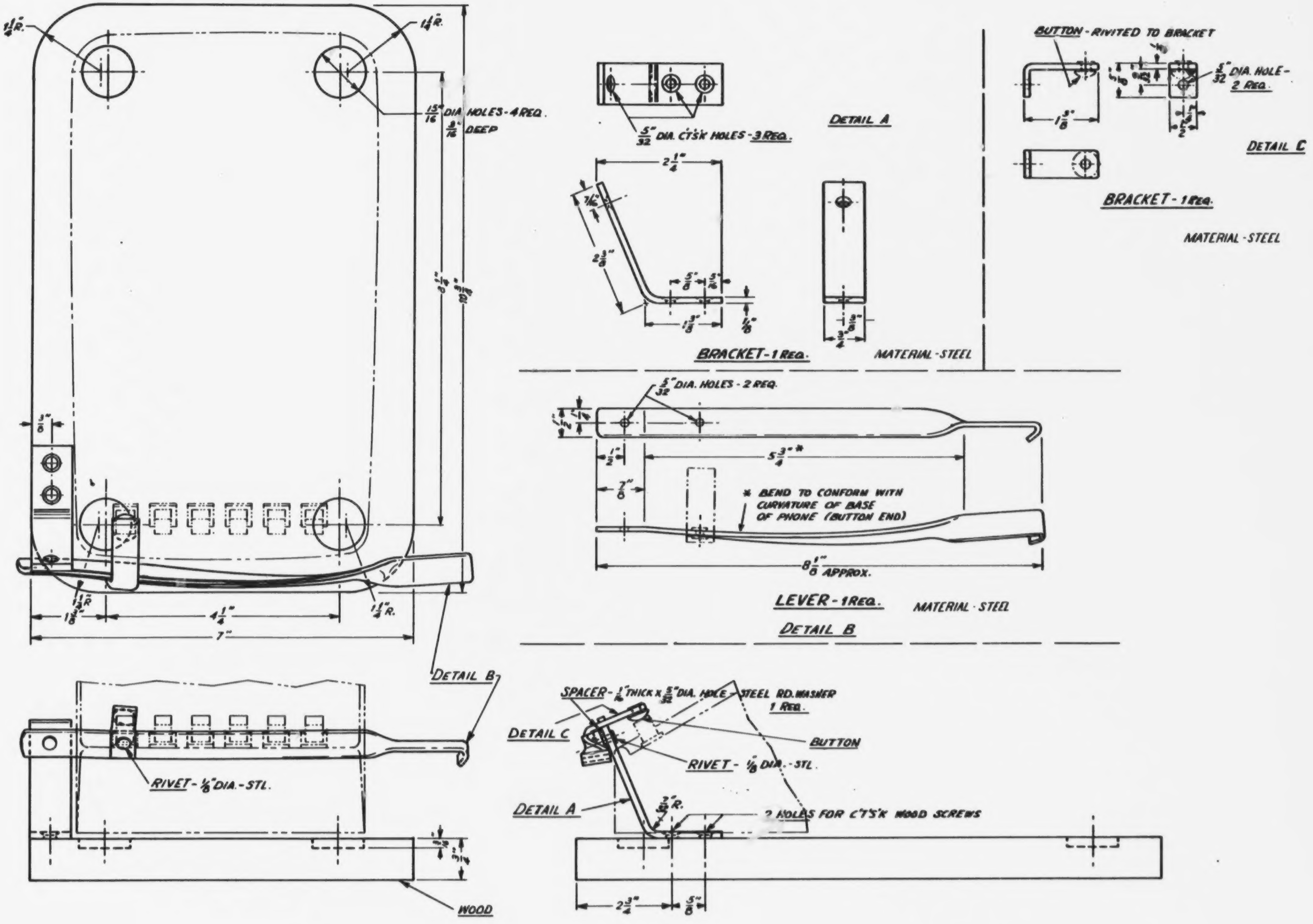

5/16" DIA.
7/16" DIA.
KNURLED FINISH
17/64" DIA. HOLE- 1 1/8" DEEP
5/8"
2"
1/4" WOOD DOWEL- LENGTH AS REQ'D.
DRILL & TAP FOR 8/32 SCREW
WOOD OR PLASTIC SAFETY KNOB

EXTENSION LEVER FOR 6017-TYPE KEY

MAT.- BRASS OR ALUMINUM


5 1/4"
1 7/16"
25/64"
11/16
25/64"
3 5/16"
3 5/16"
TRIM 2 SIDES
MAKE HOLE SNUG FIT
1/2"
1/4
3/16"
1/2"
3 5/16"
3/8
7/8"
1 1/8"
VIEW A-A
2 1/4"
3
A
2 3/8"
1 3/16"
1/8 R.
4 1/8"
1 1/8"
3/16"
8 1/2"
APPROX
WOOD
1 7/8"
1 3/4"
2 REQ. - 1 LEFT - 1 RIGHT

PADDLE LEVER DEVICE FOR SPEAKERPHONE ON-OFF BUTTONS


1 1/4" R.
1 1/4" R.
15/16" DIA. HOLES - 4 REQ. 3/16" DEEP
6 1/4"
10 5/8"
3/8"
1 1/2" R.
1 3/8"
4 1/4"
7"
1 1/4" R.
DETAIL B
RIVET - 1/8" DIA. - STL.
WOOD
5/32" DIA. C'T'S'K HOLES - 3 REQ.
DETAIL A
2 1/4"
7/16"
2 3/8"
5/8"
5/16"
1 3/8"
1/8"
3/8"
3/4"
BRACKET - 1 REQ.
MATERIAL - STEEL
BUTTON - RIVITED TO BRACKET
5/32" DIA. HOLE - 2 REQ.
1 5/8"
1/2"
DETAIL C
BRACKET - 1 REQ.
MATERIAL - STEEL
5/32" DIA. HOLES - 2 REQ.
1/2"
5 3/4" *
7/8"
* BEND TO CONFORM WITH CURVATURE OF BASE OF PHONE (BUTTON END)
8 1/8" APPROX.
LEVER - 1 REQ.
MATERIAL - STEEL
DETAIL B
SPACER - 1/16" THICK x 5/32" DIA. HOLE - STEEL RD. WASHER 1 REQ.
DETAIL C
BUTTON
RIVET - 1/8" DIA. - STL.
DETAIL A
3/32" R.
2 HOLES FOR C'T'S'K WOOD SCREWS
2 3/4"
5/8"

NOTE: — Remove all burrs & sharp edges

LEVER DEVICE FOR "HOLD" BUTTON
ON 6-BUTTON SET

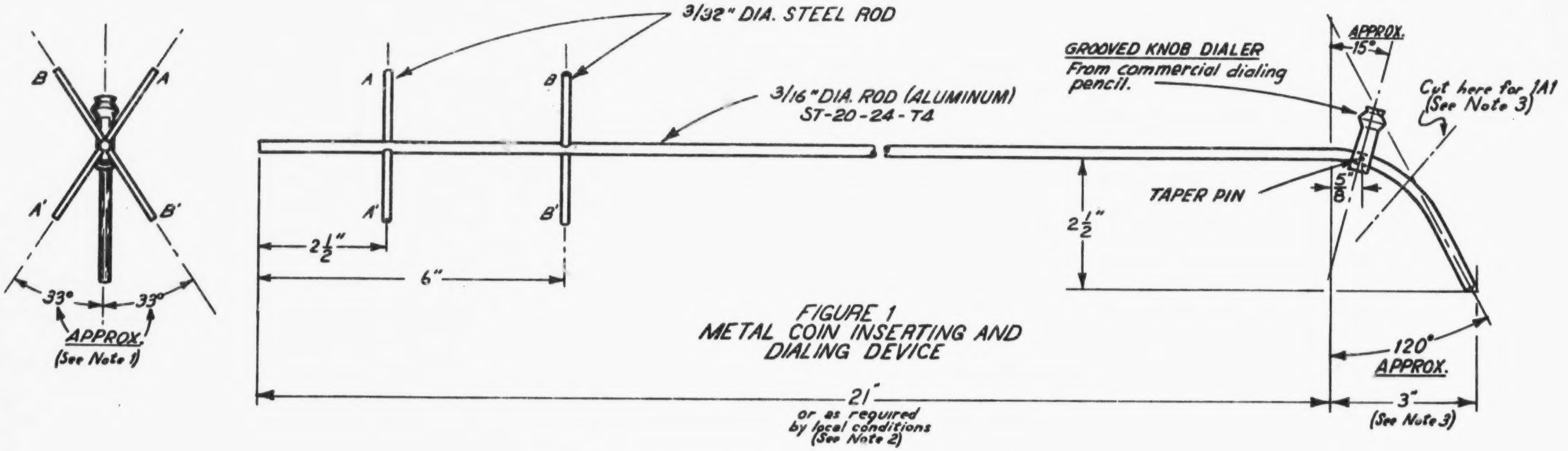
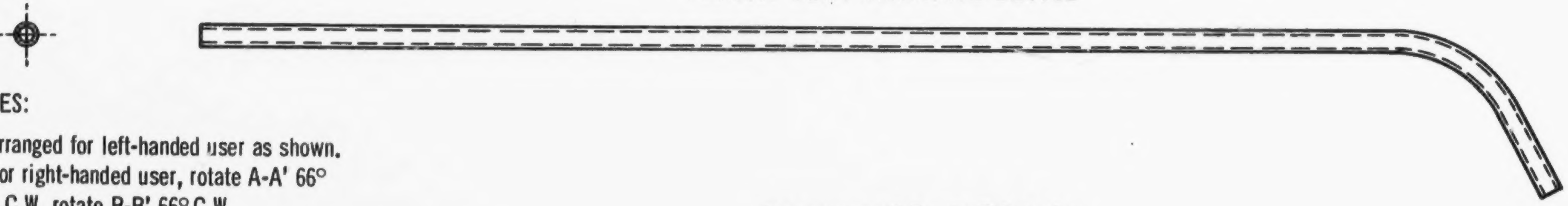

3/32" DIA. STEEL ROD
3/16" DIA. ROD (ALUMINUM)
ST-20-24-T4
GROOVED KNOB DIALER
From commercial dialing pencil.
APPROX.
15°
Cut here for 1A1 (See Note 3)
TAPER PIN
5/8"
A
B
A'
B'
2 1/2"
6"
2 1/2"
33°
33°
APPROX.
(See Note 1)
120°
APPROX.
21"
or as required by local conditions (See Note 2)
3"
(See Note 3)

FIGURE 1
METAL COIN INSERTING AND DIALING DEVICE

FIGURE 2
PLASTIC COIN INSERTING DEVICE



PLASTIC TUBE–PLEXIGLAS
3/8" O.D. × 1/16" WALL

NOTES:

1. Arranged for left-handed user as shown. For right-handed user, rotate A-A' 66° C.C.W, rotate B-B' 66° C.W.
2. Total weight 1-3/8 oz for 24" overall length.
3. Use full 3" extension for 200-series coin collectors. Cut approx. 1-1/6" beyond taper pin for 1A1 coin phone.

DEVICES FOR INSERTING COINS AND FOR DIALING

NOTES ON DESIGN AND USE OF COIN INSERTING AND DIALING DEVICES

Application

The metal coin inserting and (rotary) dialing device is intended for use by the person in a wheelchair who cannot reach to the coin slots and dial but who can employ both hands and has sufficient strength to turn a rotary dial.

The plastic coin inserting device is intended for the person who has insufficient strength to turn a rotary dial but who may still wish to use a stick for inserting a coin (see p. 137 and Fig. 42, p. 138). Where Touch-Tone calling is available, the plastic stick may be employed for dialing as well as for inserting coins.

Design of Metal Coin Inserting and Dialing Device

The length of the stick between the cross bars and the dialer will depend upon the height at which the telephone is mounted and the height to which the disabled person can raise his arms.

The device should be constructed so that, for dialing, the top cross bar may be held by the hand of the dominant or stronger arm; that is, the angle of the axis of the top cross bar with respect to the axis of the dialer should be in one direction for a right-handed person or in the opposite direction for a left-handed person.

The part of the rod extending beyond the dialer is used for inserting a coin. The length of the extension depends upon whether the device is to be used with a 200-series or a 1A1-type coin telephone. A piece of "Hold-it" (an adhesive rubbery substance obtainable from stationery stores), or equivalent, the size of a marble is placed permanently on the extension of the rod, so that a dime can be pushed against the adhesive and held by it.

Design of Plastic Coin Inserting Device

The requirements for the overall length and for the bend at the end of the plastic stick are the same as for the metal stick. As in the case of the metal stick, a piece of adhesive material at the curved end is employed for holding a dime.

Method of Use—Metal Coin Inserting and Dialing Device

The user places his hands on the cross bars, which are positioned so they will lodge in the web of the hand, across the palm, with the fingers hooking over the bars. No ability to grasp is necessary. (Using the cross bars may not be necessary for inserting a coin, as little strength is needed for this operation).

For a 200-type telephone, with its flat coin slots, the dime is placed flat against the adhesive on the end of the stick, with the lower edge of the coin projecting slightly so as to engage in the slot. For a 1A1-type phone, the adhesive is molded so the edge of the dime may be pushed into it.

The person in the wheelchair removes the handset, then raises the stick to place the coin in the slot. Gentle leverage on the stick will release the coin. The user then turns the stick around so that the dialer is facing the phone, and, engaging the dialer knob in the holes of the dial finger-wheel, proceeds to dial. If the effort of dialing seven digits would be too much for him, he may wish to dial "O" for assistance from the operator.

Method of Use—Plastic Coin Inserting Device

Coins are held by the piece of adhesive at the end of the plastic stick and are deposited as described for the metal stick. With the adhesive removed from the end, the plastic stick may be used to operate a Touch-Tone dial.

3.

General Factors Influencing the Choice of Telephone Equipment

The physical ability of the disabled person to use a telephone, while the major factor, is only one aspect of the process of selection. There are general factors that must be taken into account. The amount of use has to be considered: The person who habitually uses the telephone in his work, for example, will have different requirements than will the person whose use is occasional or mainly social. The requirement of privacy in conversation must be considered. Cost is another important factor; while a low-income family could afford only one installation to serve all their needs, other families might prefer the convenience of premium equipment and multiple telephones.

The following points should be taken into consideration before the final choice of telephone is made.

REACHING THE TELEPHONE

Answering a Call in Time

Many callers do not wait sixty seconds for the recommended ten rings and may abandon the call before the physically handicapped person they are calling can reach the telephone to lift the handset. The person who walks with difficulty may run the risk of falling if he attempts to hurry to answer. In such cases, several extension telephones would be helpful in cutting down the walking distance.

When slow locomotion is combined with weakness in the arms, as in the patient with muscular dystrophy who labors to wheel his chair and to lift the handset, a telephone with a switch could be installed. This would eliminate removing the handset as a method of answering the call, and would allow the patient to operate the telephone the moment he drew near.

Access to the Telephone

Placement of telephones in the home is customarily dictated by the availability of suitable surfaces. The location chosen by the user who walks about to reach a telephone may be entirely unsuited to the capacities of the physically disabled. The telephone high on the kitchen wall, a Princess set at the side of the bed away from the door, the telephone placed in the living-room corner obstructed by chairs and scatter rugs—all such positions can bar the physically handicapped from use of the telephone even if their physical limitations are not severe. Careful thought should be given to placement.

The patient in a wheelchair may find a wall telephone easiest to approach, but when he is unable to use the upright dial, or to reach over his chair, he may need a telephone on a shelf or table under which his chair will fit. He will then be able to make a direct approach with a minimum of maneuvering. Finding space in the home for an installation next to doorways or in corridors (or on occasion, the judicious use of long mounting cords) may avoid major rearrangement of furniture.

The ability of the severely disabled person occasionally to remain alone in the house can provide increased freedom both for him and for his family. The suitable placement of appropriate telephone equipment can permit the disabled person to make a call as necessary and will allow the family to check with him while they are away. Every endeavor should be made to ensure that the patient who uses a motorized wheelchair can operate the equipment after propelling himself to it. (Examples of such equipment are described under "Wheelchairs," p. 126.) The patient who cannot move his wheelchair may need to have the equipment placed on his lapboard before the family leaves.

USE OF THE TELEPHONE BY THE FAMILY

Altough the disabled person may need a telehpone that he alone will use, it should always be considered as an integral part of the telephone installation available to the whole family. Added convenience and a savings in cost can result from analysis of the entire household.

It is helpful to know where the existing telephones are located and the ways in which they are used by the family. This will assist in deciding whether the installation for the patient should be an additional telephone or a substitute for one presently in use.

The disabled person who uses a headset, or a Wear-it-or-Hold-it handset, will need either a telepone with headset jack or 4A key equipment. The units of 4A key equipment can be individually positioned, but when this is unnecessary, a telephone with headset jack (with its standard handset) can provide regular use of the telephone for the family and may conveniently be substituted for an existing desk set. In similar fashion, the telephone associated with a Speakerphone may be used by the entire family.

The daily routine followed by the household should be known. In some cases, the patient may need to use the telephone only during certain periods and in one particular room; at other times he may find it satisfactory to have a call answered by another member of the family. Knowing the movements of the family, and the way in which they fit in with those of the patient, can help in assuring that the installation is convenient for everyone.

Occasionally a savings in the monthly charges may be made by having wall jacks in several rooms, so that one telephone may be moved from room to room as necessary. The convenience of this should be judged by the person in the family responsible for moving it; often it will prove more satisfactory to have additional telephones.

Example 1

R.D. is a 35-year-old polio quadriplegic who operates a private transportation service from his home. His functional ability is limited to use of a mouthstick. Before improvements were suggested, he had two telephones: one was a wall set in the kitchen, where he liked to join his wife when she was at home, and the other was modified 4A key equipment with an operator's headset and a head-operated microswitch by his bed. He used a full back-reclining wheelchair, but if his wife was to be away for any length of time and not available to readjust his position in the chair, he preferred to return to the bed.

He timed his outgoing calls so that his wife could dial for him. When he was in the kitchen, she held the handset by his ear. When he was alone and in the bedroom, however, he was only able to take incoming calls. He did not want manual service, since he would have no way in which to signal callers to call again later* while he and his wife were occupied with his transfer or care. A telephone answering set was beyond his financial means.

Several improvements seemed possible. The operator's headset that had dislodged when he lay down was replaced by a lightweight headset on a headband. When service is available in his area, a Touch-Tone dial will be installed that he can operate by his mouthstick. Meanwhile, the 4A key equipment and microswitch has been replaced by a desk telephone with headset jack. This telephone has a 9-type dial. When he is on the bed, the set is placed by his head at the correct angle on a special board. He is then able to use a short mouthstick to dial and to operate the lever switch. At night the board is removed and the telephone is placed on the bedside table for his wife's or his use.

The wall phone in the kitchen was replaced by a wall jack to which the desk telephone with headset jack can be transferred when R.D. goes into the kitchen; the handset is available for his wife's use and he now has a means of using the lightweight headset away from the bedroom. When Touch-Tone service is available, he will be able to dial a telephone placed on his lapboard when he is in the kitchen. Until then, his wife will continue dialing for him, since using a long mouthstick on a rotary dial is inadvisable.

---

*Leaving the handset off the switchhook for the dial tone to indicate a busy line is not advisable. In some areas this can result in the line disconnecting itself and remaining out of service for several hours. A somewhat more acceptable method of indicating a busy line is for the user to *dial his own telephone number*. This will produce a busy signal that will continue until the handset is replaced. *CAUTION:* ONLY TO BE USED UNDER EXCEPTIONAL CIRCUMSTANCES AND FOR SHORT PERIODS OF TIME.

Example 2

J.V. with athetoid cerebral palsy, and G.V., with multiple sclerosis (Fig. 2), were newly married and, sponsored by the Department of Social Welfare, had moved from an institution to their own three-room apartment. J. had no function in her arms, propelled her wheelchair by her feet, and carried out as many tasks as possible by using her mouth. Her husband, G., was also wheelchair-bound and, although his trunk balance was not good, had good use of his arms.

One telephone in either kitchen or bedroom was considered insufficient; a long narrow corridor connected the two rooms, and access to the telephone could be blocked if either patient fell there. Two telephones were needed, priced as economically as possible to fit their budget.

A gooseneck arm to assist J. was considered at first, but a position for the handset could not be found that could be used easily by both J. and G. J. had always lifted the handset of a desk set with her teeth, put it on the surface of the table, and placed her head down to it, but her teeth had already suffered damage from use of a mouthstick and holding a handset this way was considered a poor practice. To protect her teeth and to ensure that the handset would not fall when she lifted it, particularly in the stress of an emergency, the handset should remain on the table and a switch should be used to connect calls. G. would use the handset in the normal manner.

The sets chosen were the two-line desk telephone on which one position was equipped and the other left unused as an "off" switch. A 2½-inch lever placed over the turnbutton allowed J. to move it easily with her chin, and a pencil was left by each telephone for her to pick up in her mouth for dialing. G. was careful to replace the handset correctly for J. after he had used it.

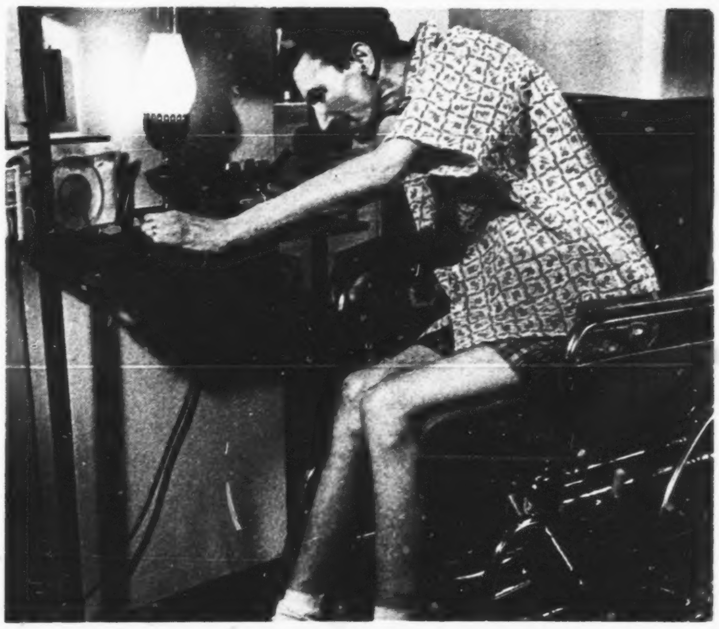
After using this arrangement for some time, J. decided that both of them could use a handset supported upright, if it were adjustable. She bought sets of shelves on poles, as furnishings for a bare wall in the living room and for the space next to the bed, and a shoulder rest, whose clamp was used to attach the handset loosely to the pole by a bolt (see Fig. 35, p. 120). The handset swiveled on the bolt and the telephone set was placed nearby, so that the handset cord lodged on it to keep the handset upright. As it was used, the handset adjusted sufficiently to suit both J. and G. A lipstick tube screwed to the shelf provided a holder for the pencil used for dialing.

2a

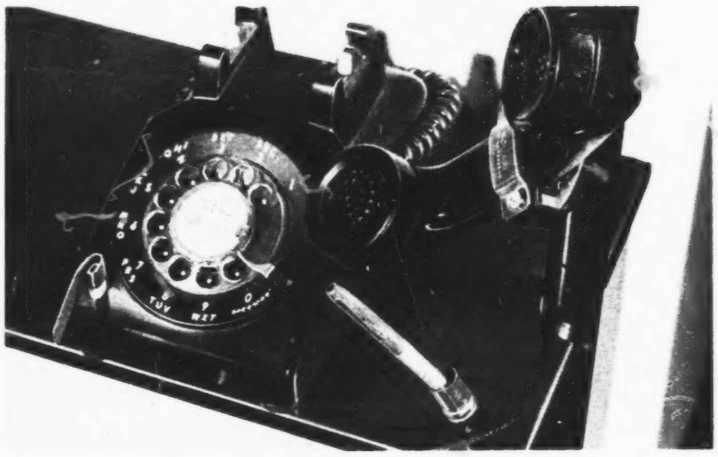
2b

ARRANGEMENT OF THE WORK AREA AND SEQUENCE OF ACTIONS

A desk or worktable of the correct height, suitably arranged for equipment and supplies to be within reach, is desirable for all who have occasion



2c



2d

FIGURE 2

J. V. has no arm function and propels her chair by her feet.

(2a) She holds a pencil in her mouth to switch on a telephone and to dial.

(2b) The handset of the two-line telephone is held in the clamp of a shoulder rest loosely bolted to the shelf pole. This allows the handset to swivel so that it adjusts to the different angles needed by Mrs. V. and

(2c) Mr. V.

(2d) Only one position of the two-line switch is equipped and a 2½-inch lever has been placed over the turnbutton. Movement between the equipped and empty position switches the telephone "on" and "off." A lipstick tube bolted to the shelf holds a pencil upright for Mrs. V.'s use.

to write and use the telephone, but is a necessity for the disabled student or businessman.

Even when the disabled person can use a desk set, it may be preferable to employ another kind of telephone (or to position handset, switch and dial within the outer limits of his reach) and to utilize space above and below his work surface.

An analysis of the disabled person's work to determine the relative importance and frequency of each task can be helpful in allocating the different telephone units to the space available. This may be particularly necessary for the severely disabled patient when his movements are restricted to a very small area. When the patient needs space for writing, considerable experimentation may be needed to find the proper place for a switch and the dial.

When the patient is limited in the area he can reach with his arms, the telephone should be placed where it will not intrude upon his work. The area within reach of both arms should be considered. The person who customarily uses one arm because it is the stronger will use it to dial. However, any slight movement in the other arm should not be overlooked since it may be sufficient to operate a switch. When there is movement in other parts of the body, different positions for a switch may be found (for fuller details, see pp. 116-118).

When space is very limited, it may be necessary to decide whether to place the dial or the switch in the position easier to reach. The choice will depend upon the way in which the disabled person uses the telephone. If he makes many outgoing calls, he may prefer the dial to be placed nearer than the switch. If, on the other hand, he prefers to be able to answer incoming calls quickly, the switch should be placed closer and the dial at a distance, allowing him to pull the dial into position as required.

The sequence of actions employed by the patient in using the telephone should also be considered. The order of using the handset (or switching the telephone "on"), listening for the dial tone, dialing, and preparing to take notes, should be as efficient as possible. For example, the patient who is using a writing device (see Fig. 5, p. 65) should not have to remove it to operate a switch for an incoming call; when the other hand is not available, the switch should be operable by a pencil (e.g., through friction tape over a line button, or enlarged tops to Speakerphone buttons).* Similarly, if the writing device can incorporate a projection for dialing, this is preferable to removing the device and picking up a separate tool to make a call.

---

*The damage to equipment that can result from using a pen or pencil for its operation makes this practice inadvisable. But the disabled person is an exception to the rule because he may have no satisfactory alternative. In this case he should be made aware of the hazards of breaking the lead and its lodging in the equipment.

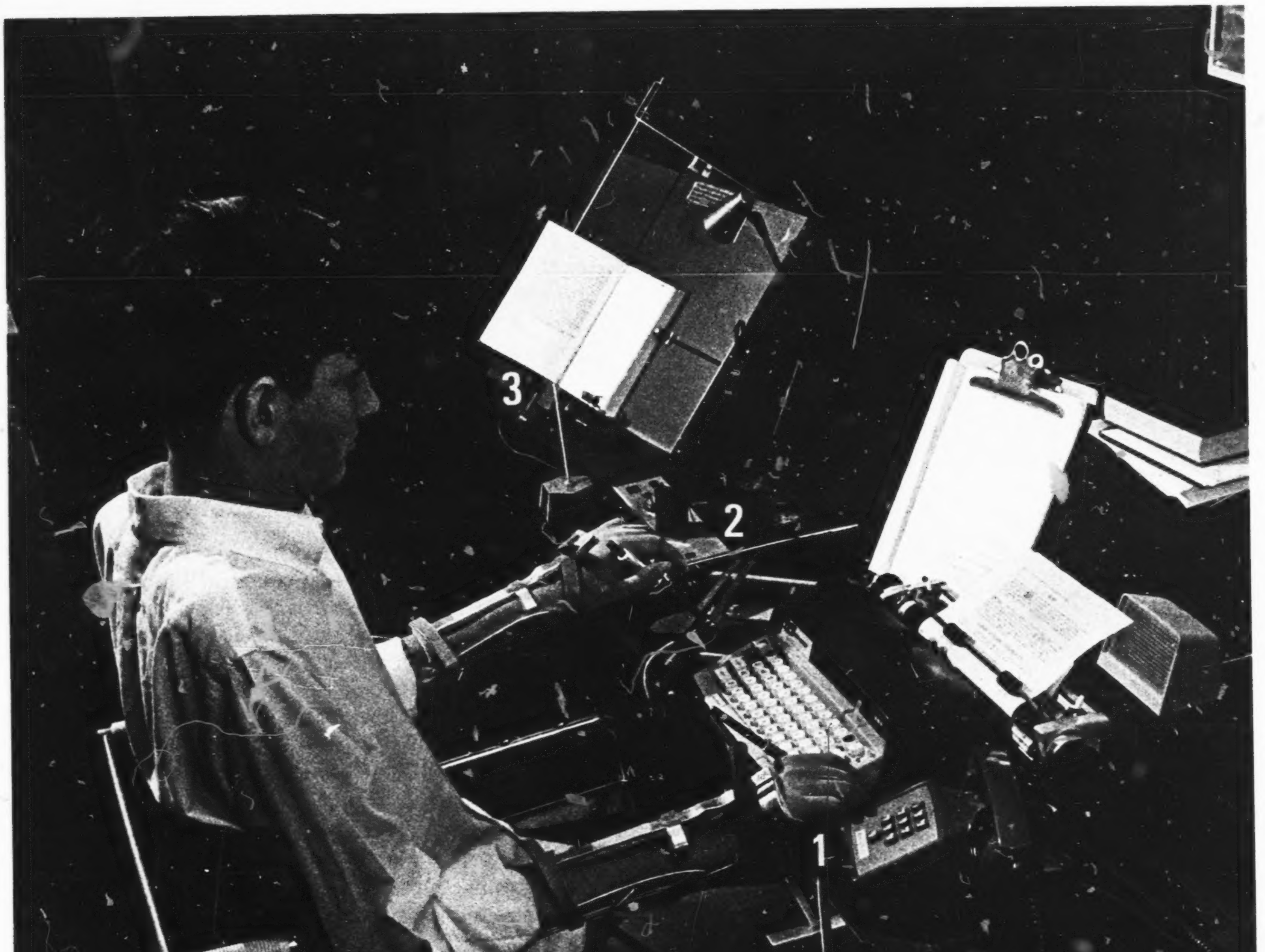

3
2
1

FIGURE 3

G. H. can move his arms only by shoulder elevation, but balanced forearm orthoses and ADL long opponens orthoses with attachments allow him to use the control stick of his motorized wheelchair (1), to type, to use the Speakerphone, to operate a tape recorder (2) and an electric page turner (3). The workplace is arranged for maximum efficiency and accessibility from a wheelchair.

Example 3

G.C., an attorney with multiple sclerosis, had only one functional arm, and poor trunk balance while sitting in the wheelchair. Her work in legal research involved the use of numerous large reference books placed within her reach on the desk. She was using a 6-button desk telephone that took up much of this valuable space. When it was placed outside the work area, she could not reach it.

As she had good use of the one arm, a hanging hand telepone was installed at the front of the desk below its top, the dial mounted at the best angle for her use, and an externally mounted 6-button unit was placed next to it. This left the desk top entirely clear for her work.

At home, a home interphone system was installed, with outlets at convenient locations that enabled her to keep in touch with her household assistant.

Example 4

G.H., a 19 year old spinal cord quadriplegic, returned from the hospital to his parents' home with plans to enter a nearby college later in the year for training as a psychologist. The high level of his injury left him the ability only to elevate his shoulders and to move his head. With the aid of balanced forearm orthoses and other assistive equipment, he was able to operate his motorized wheelchair, to type with pencils in the spring clips of his ADL long opponens orthoses, and to turn pages in books by operating an electric page turner.

G.H. expected to spend much time in his study, where a desk of the appropriate height had been built to allow space for his equipment and under which he could propel his wheelchair (Fig. 3). The area over which he could reach with either hand was very limited, so that any needed equipment had to be placed precisely and clustered closely together.

"Hands-free" equipment for conversation was necessary, and the Speakerphone was chosen for this purpose. He had sufficient strength to depress the transmitter buttons with a typing stick, but needed an area of contact greater than that provided by the small buttons. Enlarged tops to the buttons were adequate when he was seated in front of them, but they were difficult for him to reach when he drove up to answer a call. A paddle lever device was more satisfactory, since its projecting levers allowed him to reach them after approaching from either side. The wheel that replaced the volume-control knob could be turned by the typing stick or the tips of his fingers.

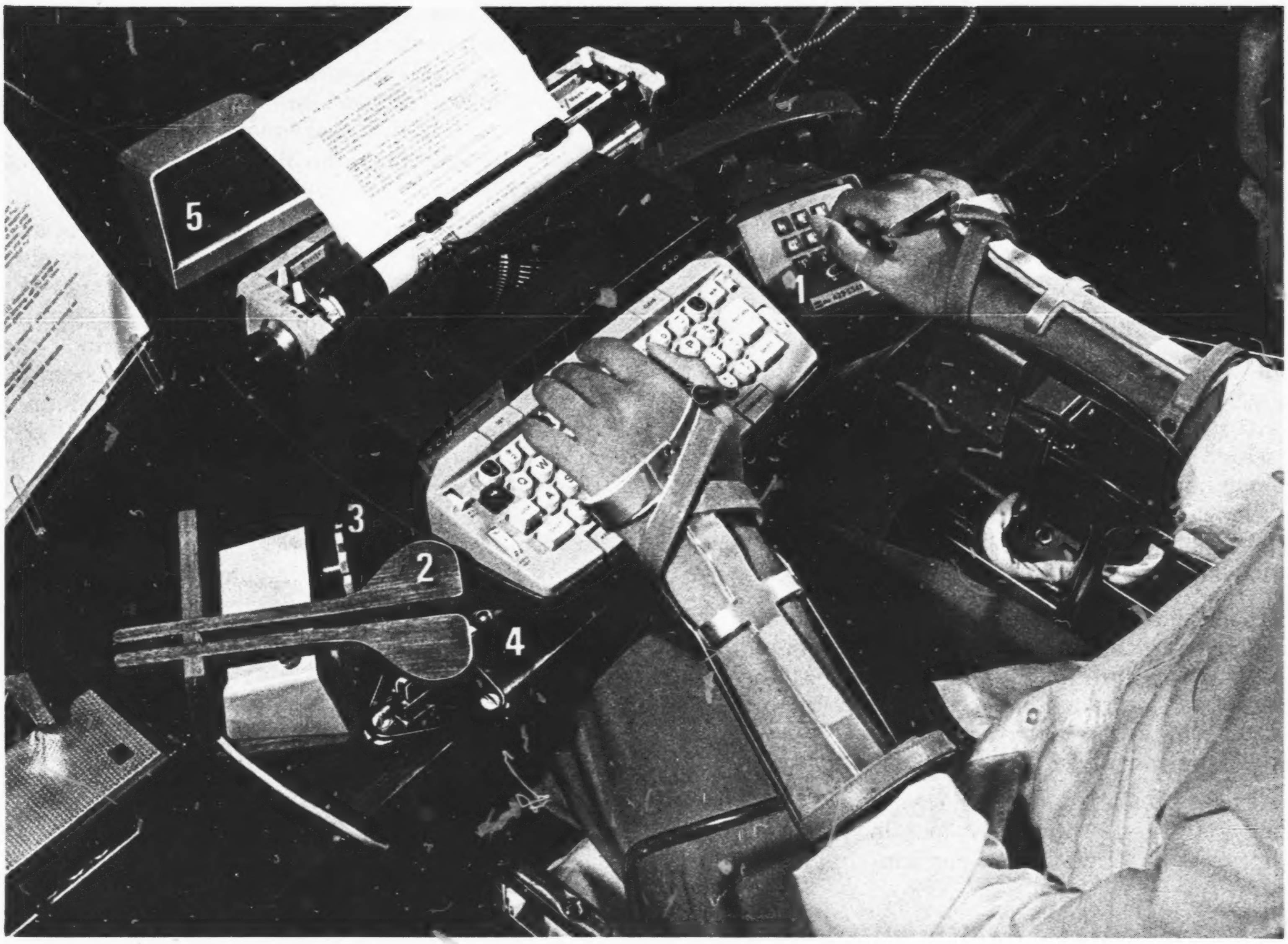
Touch-Tone calling was available in his area, and he was able to depress the buttons by the typing stick. Since he had greater control over his right arm, the desk set was placed by his right and the transmitter by his left (Fig. 4). Since the loudspeaker incorporates no controls, it could be placed at a distance. G.H. would have use only of the dial of the telephone set; if space had been more limited, the telephone could have been replaced by a separately housed dial. While the lower height and lesser inclination of this dial would have allowed him to depress the buttons more easily than those on the telephone set, the difference was not significant enough to warrant the change, particularly since other members of the family would use the handset on occasion.

The transmitter and telephone were placed on either side of his typewriter, so that he could answer or place a call while typing. When he was seated before the page turner, a slight adjustment of the chair's position allowed him to operate the transmitter with his right hand.

This arrangement was not entirely satisfactory when he was away from the room and needed to return to take a call. An improvement would have been an additional switch placed near the door. Since he was able to operate a 6017-type key, it would have been helpful to secure this unit to the end of the table, so that he could drive past it, operate it with his right hand, and continue round to face the transmitter.

Another alternative that would have avoided this additional equipment (but would have required assistance from the family) would have been to move the transmitter to the end of the table when G.H. was not planning to use his typing area. Unfortunately, however, this was not foreseen at the time of installation and the mounting cord was not long enough to allow such a move. The arrangement of a workplace can be planned before it is built, but the final positions of the units for greatest efficiency are frequently found only after a trial period of use. Extra-length mounting cords for the units would have provided greater flexibility and the opportunity to experiment.

G. was able to move his wheelchair throughout the entire first floor of the house and out onto the patio. When a call came for him, it was not always convenient to return to the Speakerphone. It would have been an advantage to be able to talk over the handset of the Princess phone in the living room or the wall set in the kitchen. The handset cord of the kitchen phone was replaced by



4

FIGURE 4

G. H. can move his hands in an arc, as shown. He can exert a downward force of 1½ lb. by the pencil secured to his right hand and 1 lb. by the pencil in his left. He has better control over his right hand than his left, so the Touch-Tone dial (1) was located under his right hand. The paddle-lever device (2) near his left hand allows him to switch the Speakerphone "on" and "off" by the pencil (See Fig. 3), and the volume-control wheel (3) also permits adjustment by pencil. The micro-switch for the tape recorder (4) may be seen in front of the Speakerphone transmitter. The loud-speaker (5) incorporates no controls and was placed at a distance.

a 9-foot cord to permit the handset to be taken out to the patio. Use of a standard handset, however, required someone to hold it by G.'s ear. While G. could have used a headset if the Princess set were replaced by a telephone with headset jack, this would have entailed additional expense. Moreover, the change would not be applicable to the wall set in the kitchen. Instead of changing telephones, a spring-clamp device was constructed for insertion into the headrest socket in his wheelchair frame. A standard handset from any of the telephones then could be placed in the spring clamp, and the gooseneck arm bent to place the receiver by his ear (see p. 37).

G.'s bedroom opened off his study, and he would have liked to use the telephone while in bed. This was discussed and a plan devised for a special arrangement that will be carried out at a later date. A wheeled cart will be obtained, on which the Speakerphone and its equipment box can be placed. Wall jacks will be installed by G.'s bed and by the desk in his study. Another may be placed in the living room (and all jacks will be at waist level to reduce the work of the family). The Speakerphone may then be moved from jack to jack as needed. The cart will be low enough to go under the desk, and small enough not to block G.'s wheelchair. The cords of transmitter, loudspeaker, and telephone must be long enough for the units to be moved into position from the cart. These lengths will be calculated in advance of the installation.

G. will not be able to use the transmitter buttons while in bed, because he can use his arms only when he is in the wheelchair and using his assistive equipment. Another method of switching will be necessary. Since he is able to turn his head, he can use a head-operated switch, and the Speakerphone can be wired so that pressing once turns it on and pressing a second time switches it off. As G. will need the assistance of the operator to place a call from this position, manual service will be requested. The family's use of the telephone will not take the operator's time, as a time-delay device (special assembly) will be used.

USE OF THE TELEPHONE AT PLACE OF WORK

Use of the telephone at a place of work may differ from its use at home due to the noise of other workers, the need for privacy, and the necessity for fellow workers to make use of the same telephone. Additional operations at work might include the use of extension and hold buttons, summoning a secretary or another staff member, and possibly the use of a tape recorder. These controls may need to be taken into consideration when planning the layout of the work space to conform to the disabled person's function.

The cost of installing a telephone at a place of work normally is borne by the employer. Hence no decisions can be made without his approval and cooperation. The analysis by the evaluator of the tasks performed by the disabled person and the layout of his work area should result in an installation that would seem most reasonable from the viewpoint of the employer. When the Speakerphone is considered, its location in a noisy office and the extra expense involved may make this unit unacceptable to him. Unless the disabled person has his own office, a headset is better suited to business use than a Speakerphone.

Examples 5 and 6

M.C., a 53-year-old hemiplegic purchasing agent needed to have his good hand free to write quotations during telephone conversations. Outside vendors frequently were in his office, and his telephone conversations had to remain private. For this reason a Speakerphone was unsuitable, and he chose an operator's headset and a desk telephone with headset jack. Because he had used a headset some years earlier, he needed no training in the technique of adjusting and placing it on his head with one hand. At busy times he kept it on between calls.

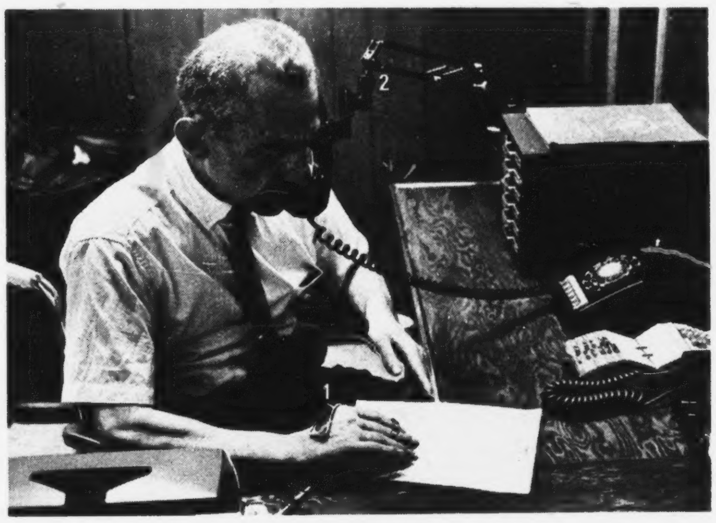
The handset of the desk telephone could be used by other members of the staff, and also by M.C. when he knew he would not have to keep his hand free for writing. If it did become necessary to take notes during such a call, he could excuse himself to put on the headset and then transfer the call to it by using the lever switch before replacing the handset.

L.A., also a hemiplegic, was a desk clerk at a small hotel. He frequently answered the telephone and occasionally had to write messages for the guests. He chose the Wear-it-or-Hold-it set, because putting on the headband was quicker than using the operator's headset, and the former set could also be used without difficulty by the other desk clerks.

Example 7

J.S., had been a baker before the injury that resulted in a spinal cord quadriplegia. After hospitalization, he worked as a purchasing agent in an industrial plant. Since holding a handset was too tiring, he chose to support it by a Luxo extension arm. The telephone was a 6-button set and he used the line buttons for connecting and disconnecting (Fig. 5). Since all five lines were in use as extensions, he switched "off" by depressing a button part-way down.

J.S. had his own office, but occasionally another member of the staff would attempt to use his telephone. This proved difficult because the handset-holding arm could not easily be moved upward to reach the ear of someone standing. The supplementary use did not warrant installing an additional telephone, but an extra handset was required. The 6-button telephone was exchanged for a 6-button telephone with headset jack. An operator's *hand*set was plugged into the jack and supported on the Luxo arm. A lever was placed over the headset switch, and J.S. could either keep



5

FIGURE 5

J. S. is purchasing agent in a small industrial plant. He has partial function in his hands and uses a writing device (1) for his work. While he is able to use a standard handset, holding it for long periods of time is fatiguing and he prefers to have a handset-holding device. Illustrated is the Luxo extension arm (2), which he can pull into position as needed and push away after use. The line buttons of the 6-button telephone are used as an "on-off" switch.

this switched to the jack, using the line button for the "off" switch as before, or use the headset switch to disconnect a call. In the latter case, if a line button had been left depressed, he would cut into this line when he switched "on." He therefore continued to use the line buttons as switches. The handset on the telephone was available for use by others, in which case J.S. would switch "off" the headset switch. He would leave it ready in this position when he left the office.

Due to the circuit arrangements, an operator's handset plugged into a desk telephone with headset jack gives additional amplification to the sound transmitted. This was welcomed by J.S., whose voice was not strong, since it meant he could be heard well even if the transmitter was not near to his mouth.

4.

Introduction to the Evaluation of the Patient: Equipment Analyses

An evaluation of the patient can be considered to be in two parts: evaluating his physical function and testing his use of the equipment.

The purpose of an evaluation of physical function is not to grade muscle strength or to measure joint range of motion, but to provide the evaluator with an indication of the patient's potential ability to use one item of equipment rather than another. This evaluation is desirable, since a patient should not be asked to test equipment that is beyond his capability to use. People face their disabilities in different ways; one person will try anything that offers the opportunity for greater independence, whereas another will not attempt any activity in which he believes he will fail.

An evaluation allows equipment to be selected with which the patient can have immediate success. Afterward, the patient can attempt to use the more difficult items. For example, when the evaluation shows he may have difficulty using a handset he should test "hands-free" equipment first.

The patient may remark that he cannot perform one of the actions involved in telephoning—for instance, using a handset. The evaluation procedure allows the evaluator to confirm this, or to discover tactfully that the patient appears to have potential ability to use such an item of equipment.

The patient who states he cannot use a handset may not be aware that different types of equipment are available that he has not tried in the past. The evaluator may consider during the evaluation that the patient could use the Wear-it-or-Hold-it handset, for example. At the appropriate time, he could point out that others with a similar condition have been able to use it, and ask the patient if he would care to try. The set should be placed in the most suitable position and the patient shown the steps required in its use.

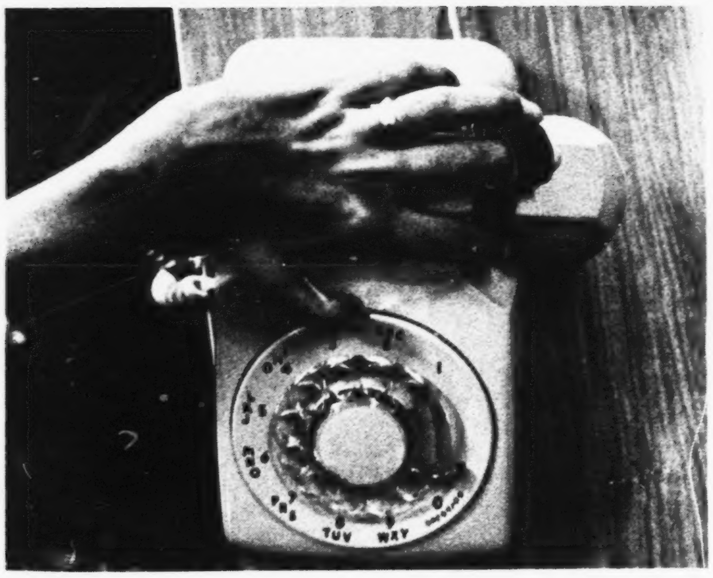
In order to judge whether the patient's physical function is sufficient to use a handset or a switch or a dial, an understanding of the methods of operating the equipment and the motions involved is helpful. The following analyses are given as background to the Evaluation Procedure (outlined fully on pp. 79-83) and the Equipment Tests which follow it.

ANALYSIS: 1) USING THE HANDSET

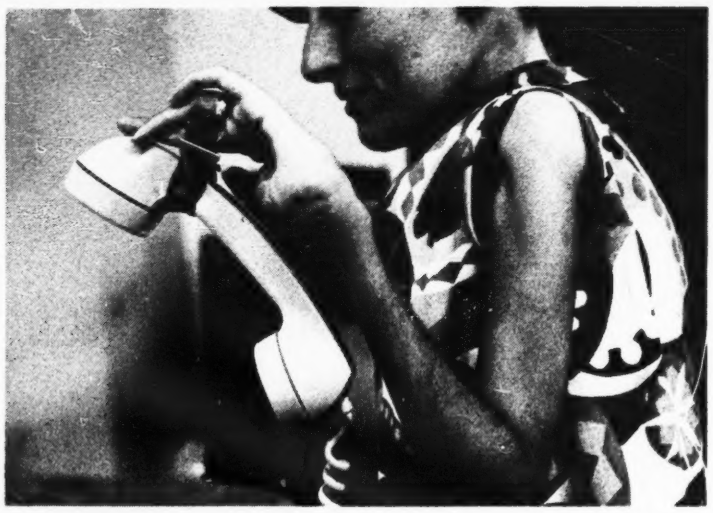
Using a handset requires ability in two aspects of arm function:

The ability to move the arm sufficiently to place the hand by the head. When muscle strength in the arm is reduced, the methods used may include propping the elbow up on a table or chair arm, assistance from the other hand, bending the head to meet the hand, moving the trunk, or other methods the patient has developed for himself.

The ability to hold the handset. If it cannot be grasped between fingers and thumb, the receiver end may be hooked into the web of the thumb; the



6a



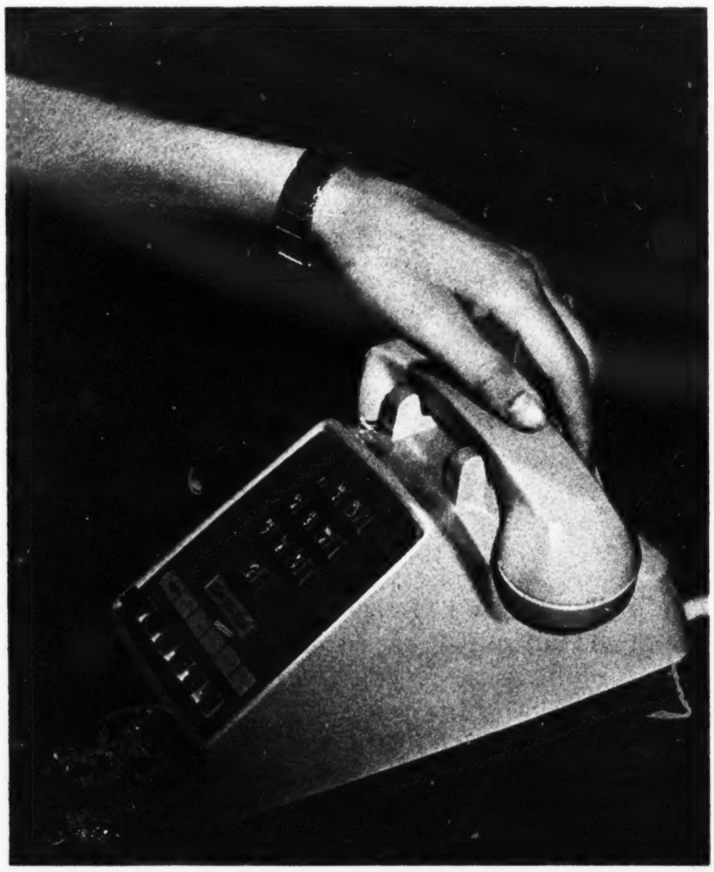
6b

FIGURE 6

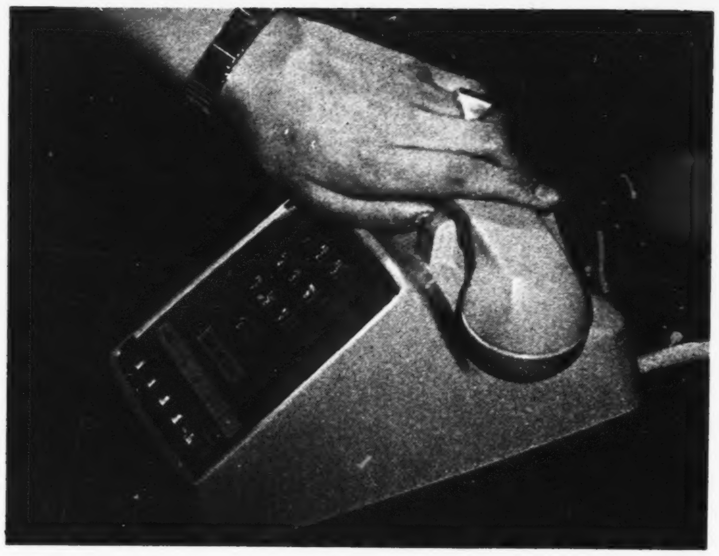
Holding a standard handset.

(6a, b, c) The person who can extend her fingers but cannot flex them to grasp a handset may use a looped strap around the handset handle.
(6d, e, f, g) The spinal cord quadriplegic with functional wrist extensors and without finger function can use a tenodesis grip to grasp and lift a standard handset:
(d) He places his fingers on the back of the handset.
(e) He pulls his arm toward him to bring his thumb to the front.
(f) Pushing forward on his arm brings his thumb under the handset. At the same time, he begins to extend his wrist to tighten his fingers in a grasp.
(g) After he has turned his hand, the handset slides back into a better position in his hand and rests on his thumb. The square shape and good balance of the standard handset prevents it from rotating in his very weak grasp.
(a. Postpolio.)
(d. Spinal Cord Quadriplegic, Group D.)

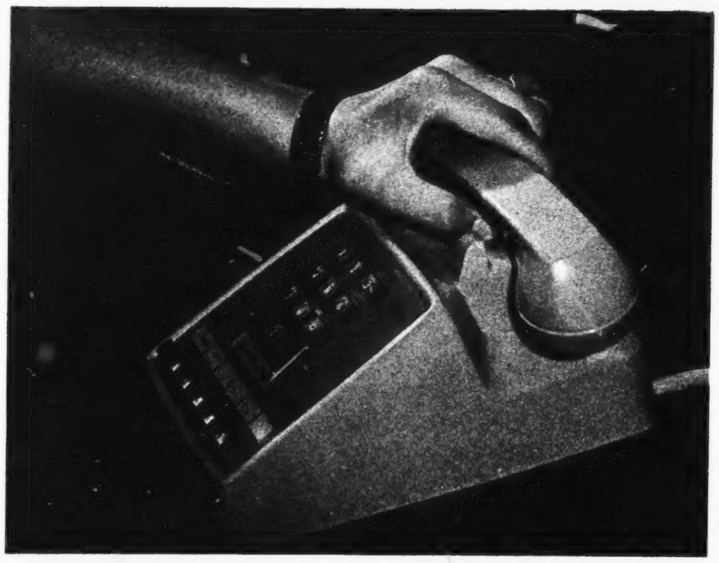
6c



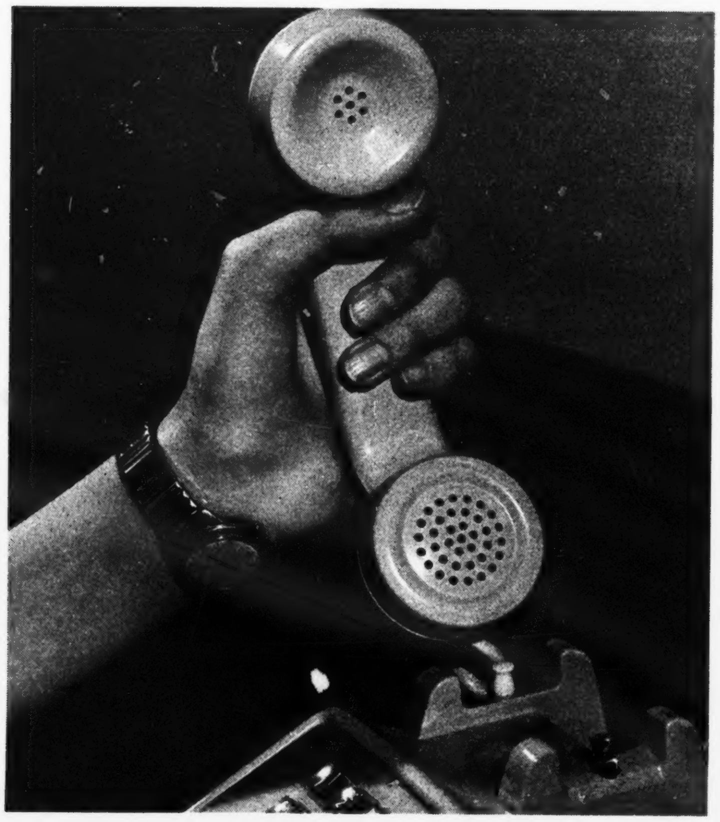
6d



6e



6f



6g

handle may be pinched between two fingers; the handle may be manipulated by both hands; or the extended fingers may be slipped under a loop around the handset handle (Fig. 6). NOTE: The Wear-it-or-Hold-it set used as handset *does not require* motion in the fingers (Fig. 7).

The essential action involved is to move the arm into position (a detailed analysis of the minimum function required is given in Appendix B). A simple test of the patient's ability to do so can be made during the evaluation *by asking him to place his hand as near to his ear as possible*. The patient's response is interpreted according to his type of disability, as follows:

Loss of Joint Range of Motion

Unless the patient's hand comes to within one or two inches of the chin, it is unlikely that he can use a handset. Joint deformities of the hand will not necessarily bar his holding a handset (Fig. 8).

Loss of Coordination

The patient's coordination should allow him to place the palm of his hand flat against his ear. Nevertheless, the patient should attempt later to use the handset by employing both hands, when feasible.

When the patient exhibits a serious loss of control, there is a possibility that, in using the handset, he may injure himself with it. Asking the patient to perform the motion first allows his control to be evaluated, so that when he does try using the handset, the evaluator can be prepared to place his own hands in a position to steady the handset.

Loss of Muscle Strength

The patient who can place the palm of his hand against his ear can use a handset (provided he has a means of holding it). If any part of the palm of his hand reaches his cheek, there is a strong possibility that he can use a handset.

The methods of holding the handset, outlined earlier in this analysis, are appropriate to the patient in this category. But when the patient is unable to utilize them because of a loss of both wrist and finger function, he may still be able to use the Wear-it-or-Hold-it handset, when his wrist is stabilized by wrist extensors or a wrist orthosis.

WEIGHTS OF HANDSETS

G1 Standard handset—14 oz.
G2 Standard handset—13 ½ oz.
G3 Standard handset—11 ½ oz.
G6 Impaired hearing handset—12 ⅛ oz.
G7 Weak Speech handset—13 ½ oz.

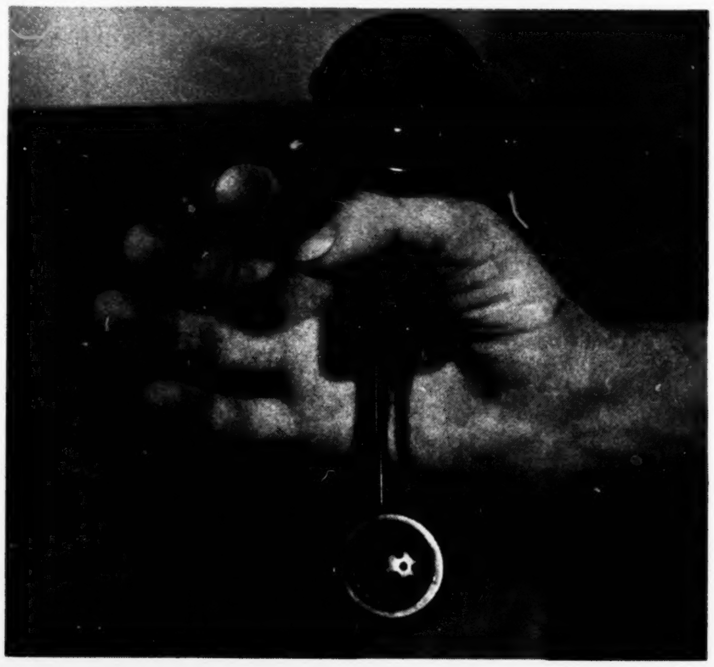
Wear-it-or-Hold-it handset—8 ½ oz.
(A comparison of the standard handset and the Wear-it-or-Hold-it handset is tabulated on p. 30.)

Trimline handset, rotary dial—12 oz.
Trimline handset, Touch-Tone dial—13 oz.

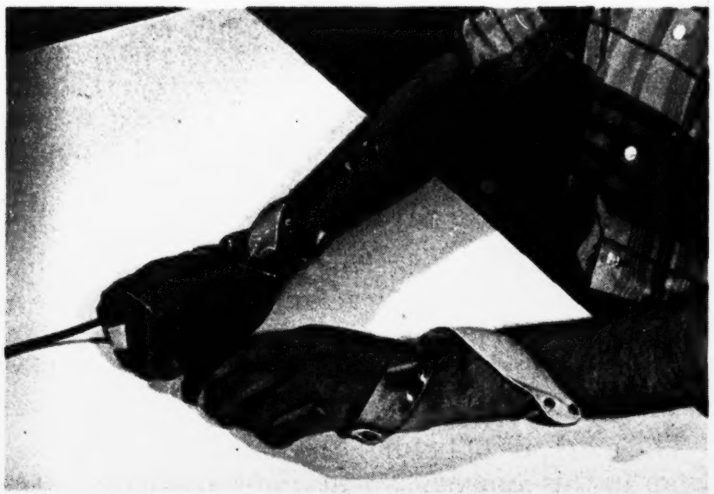
7a

7e

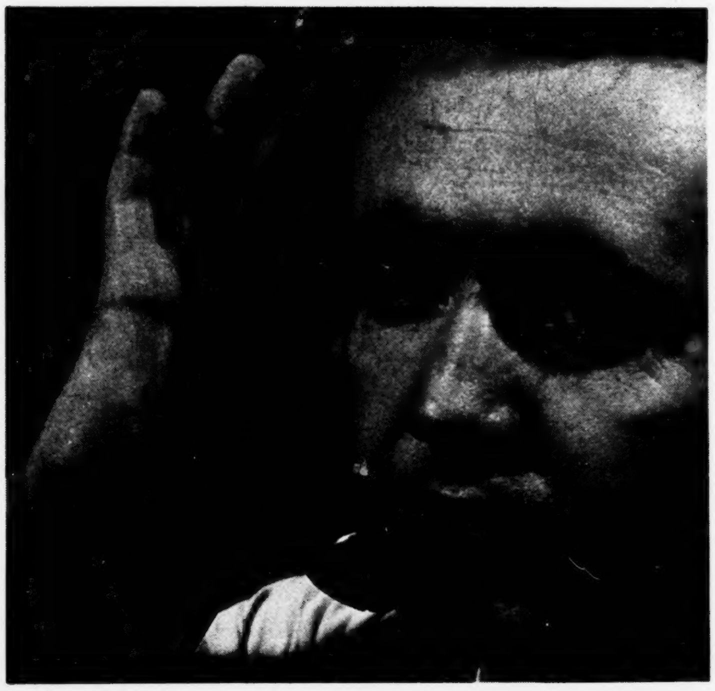
7b



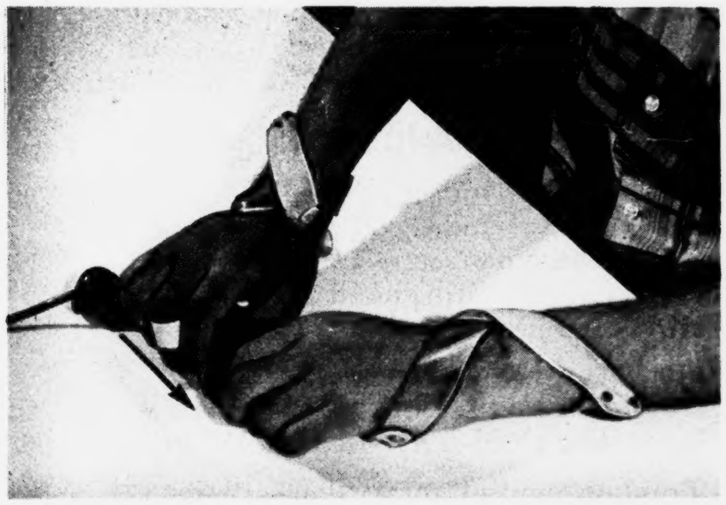
7f



7c



7g



7d

FIGURE 7

Using the Wear-it-or-Hold-it set as handset.

The person without finger function but able to maintain his wrist in extension, by muscle strength or the support of an orthosis, may use a Wear-it-or-Hold-it handset when either (c) his thumb is positioned in abduction, or
(7a) his fingers have some tightness in flexion.
(7b) One hand is used to block any movement of the handset, the thumb of the other is placed under the handle and
(7c) the arm is pushed forward to bring the handle into the web of the thumb.
(7d) The hand is then moved across toward the receiver end as far as possible before attempting to turn the hand.
(7e) If the handset slips as the hand is turned, the receiver end may be prepositioned on a one-inch block.
(7f, g) After the hand is turned, the Wear-it-or-Hold-it set is brought to the ear resting on the thumb.

(a, e. Spinal Cord Quadriplegic, Group E.)
(b. Spinal Cord Quadriplegic, Group B.)

8a

8b

ANALYSIS: 2) USING SWITCHES

A switch for connecting and disconnecting the line is essential only for those who are unable to lift and replace a standard handset on the telephone.

The different kinds of switches require varying amounts of force applied either vertically or horizontally. One type may be more suited to the capabilities of the patient than another, and this may modify the final choice of telephone. Switches are of three principal types:

Pushbutton: as on a 6-button telephone and Speakerphone transmitter. (Movement required: pressure downward.)

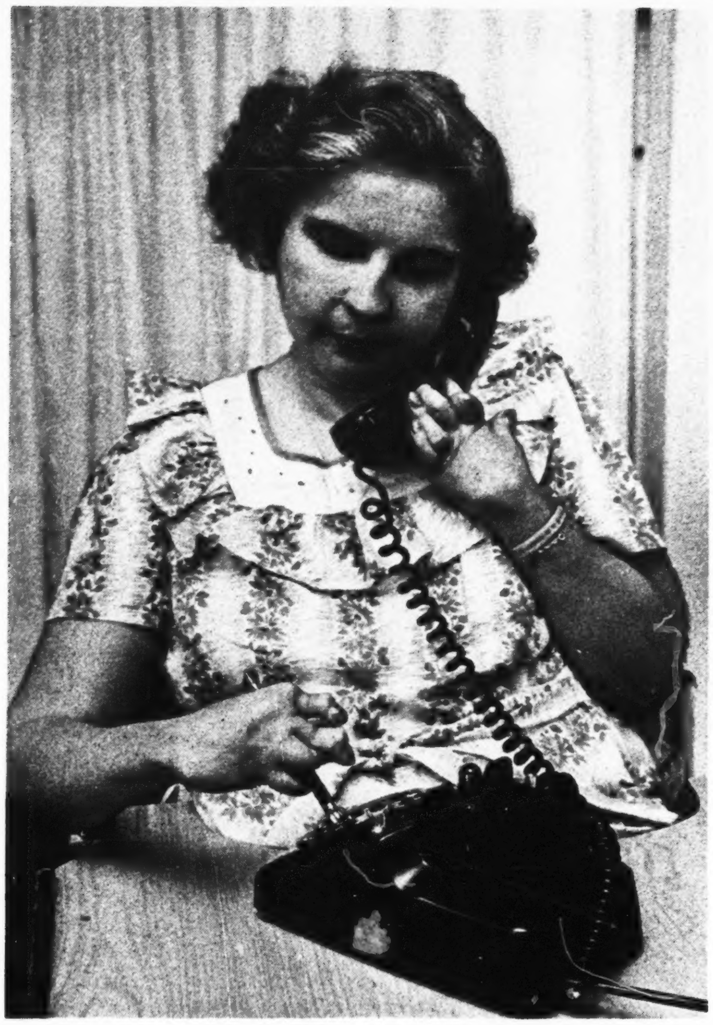
Turnbutton with lever modification: as on a telephone with headset jack or two-line telephone. (Movement required: horizontal on desk sets, vertical on wall sets.)

Toggle lever: as on a 6017-type key and the key of 4A key equipment. (The direction of pressure is determined by the mounting of the key. Fig. 9.)

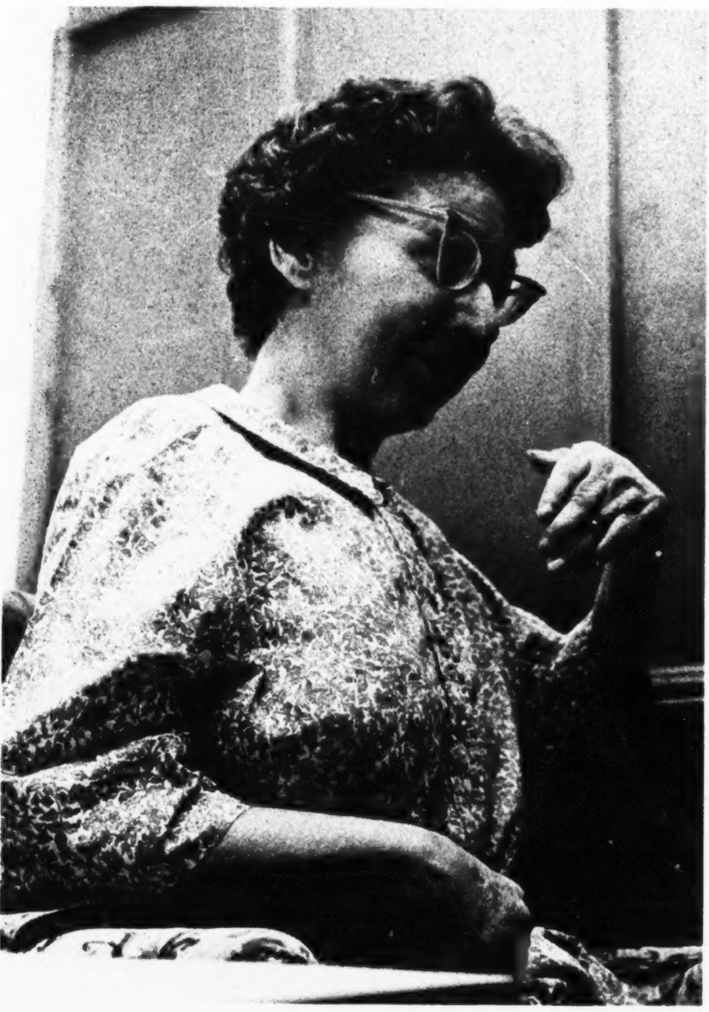
Methods of Making Contact With a Switch

Pushbuttons require pressure from a projection, either a finger, thumb, part of an orthosis or a pencil. If the patient does not wear a suitable orthotic device and cannot use his finger or thumb, a means of stabilizing a pencil in his hand must be found. The eraser end should then be used to apply pressure:

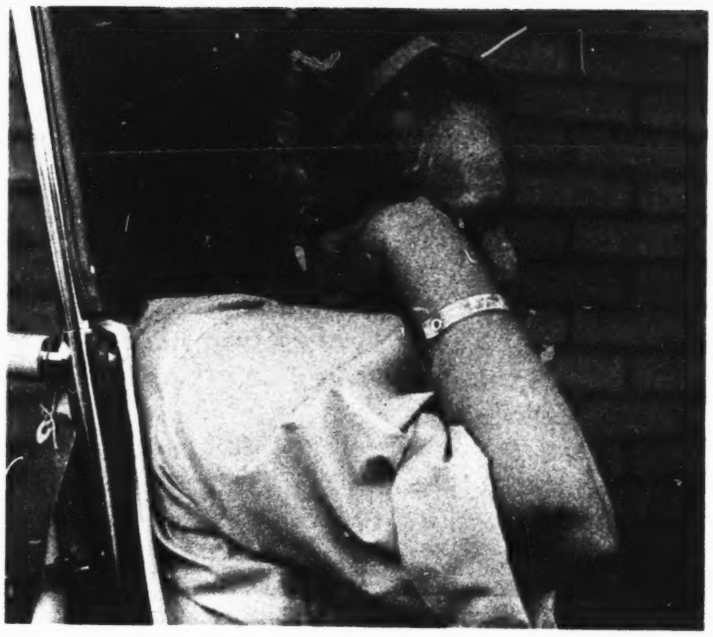
a) A padded pencil, if he can hold it (see Fig. 17c, p. 95).



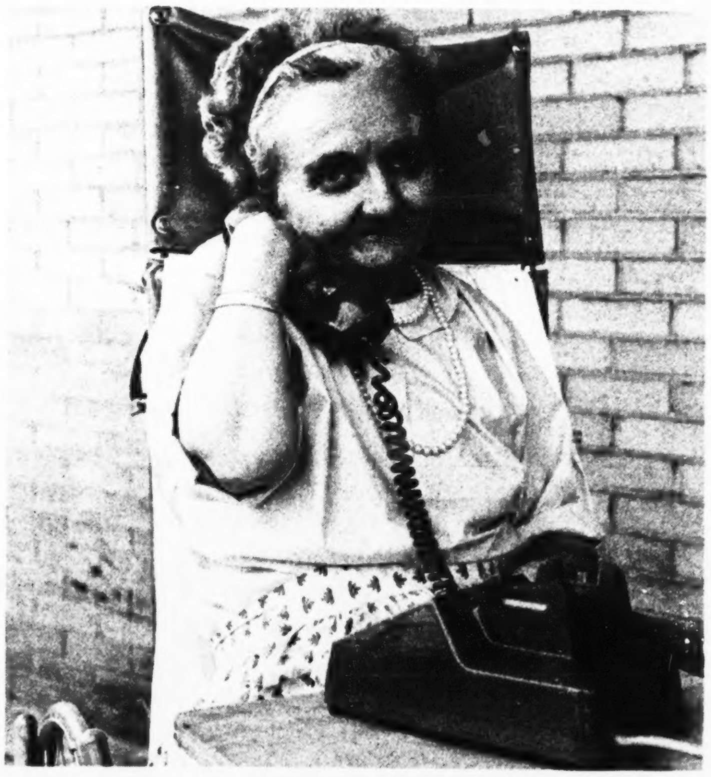
8c



8d



8e

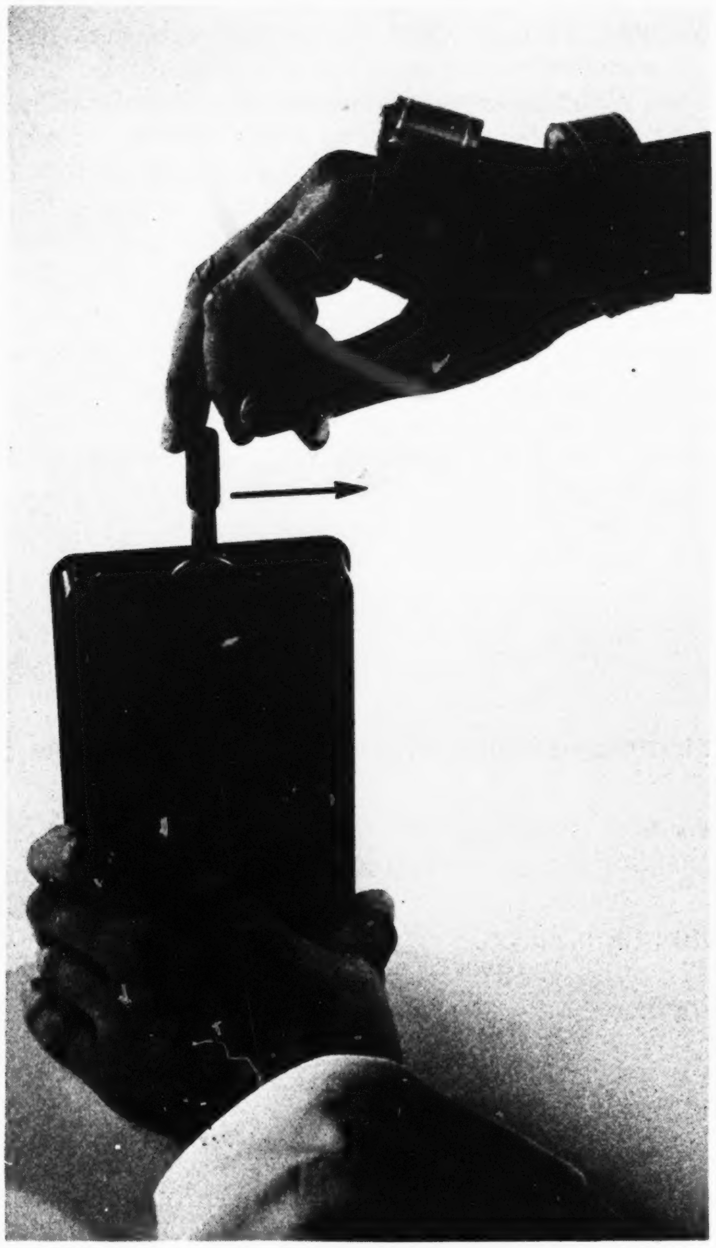


8f

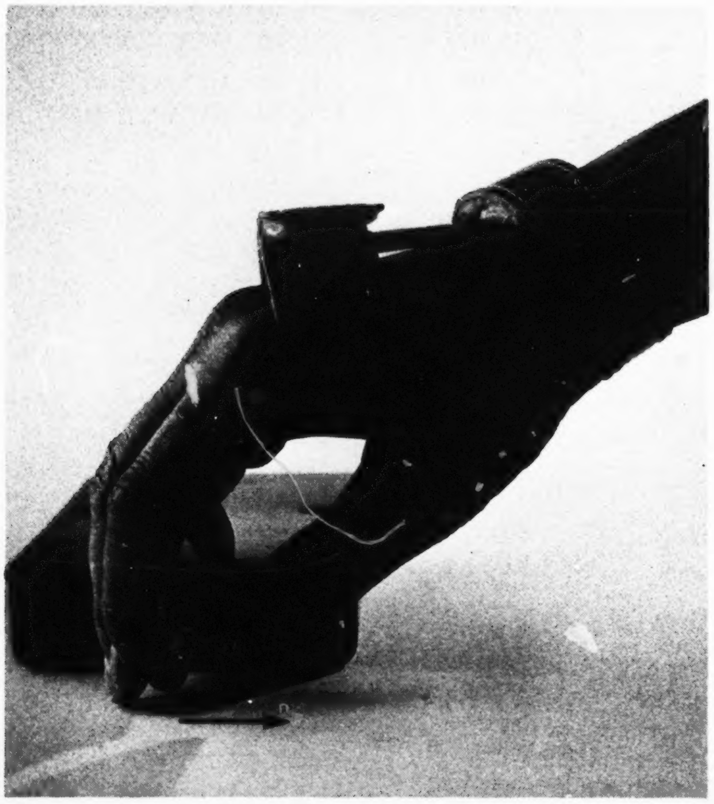
FIGURE 8

The patient with loss of joint range of motion.

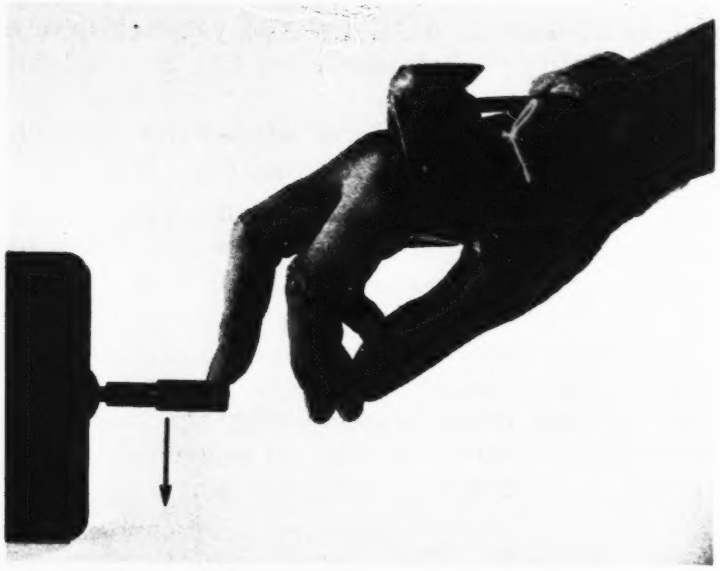
(8a) When the hand comes to within one or two inches of the chin,
(8b) a handset may be used. (see preceding page.)
(8c) Changes in the joints of the hands do not necessarily bar holding the handset.
(8d) "One or two inches" is an approximate figure. This patient's elbows are ankylosed and she can use a handset, but not by a method that is comfortable or recommended. (The preferred equipment for her is seen in Figure 1.)
(8e, f) The palm of the hand need not be placed flat on the ear for persons in this category.



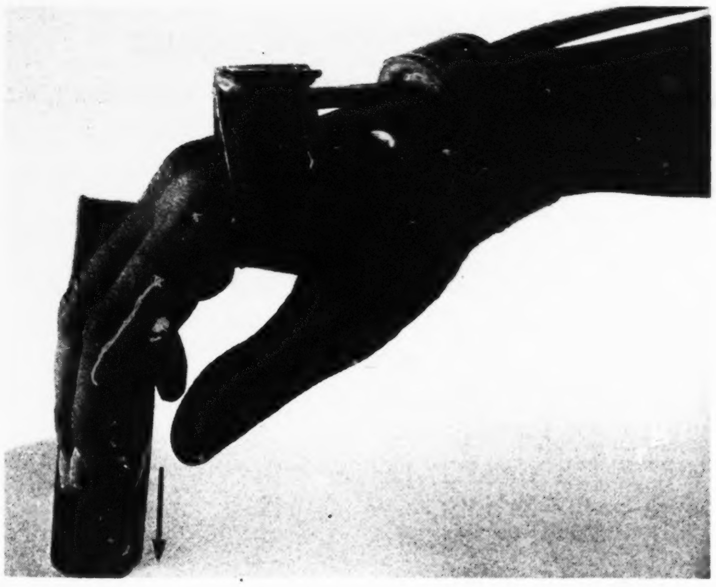
9a



9b



9c



9d

FIGURE 9

Positioning the modified 6017-type key.

A 6017-type key, modified by a longer toggle lever, requires little force to operate and may be mounted to operate in the direction best suited to the user's physical function.

Horizontal movement

(9a) The key is placed upright under the patients hand, and held stationary by the evaluator. Pulling the lever switches "on," and pushing it switches "off." From this position, the toggle lever allows contact by only one finger.

(9b) With movement in the same direction as (a), placing the key on its side allows a wider area of contact.

Vertical movement

(9c) The key faces toward the hand for a downward movement to be employed. This position allows contact by only one finger.

(9d) With movement in the same direction as (c), turning the key sideways allows a larger area of contact on the toggle lever.

b) If he uses an ADL orthosis, a pencil may be placed in its pocket (see Figs, 11c, d, p. 87, and 20, p. 98).
c) An elastic universal cuff slipped over the palm of his hand to hold a pencil (see Fig. 19, p. 97).

The pencil should be only long enough to allow the patient to see its end during his use of it. If it is too long he may not be able to control it. In order for all his force to be exerted on the button, there must be no play where the pencil is secured in the hand. The pushbutton must be placed where the patient can reach it easily with the end of the pencil and aligned so that its movement corresponds to the direction of the movement he uses.

When the patient plans to use a Touch-Tone dial, the eraser end of a pencil is an appropriate dialing tool. When he wishes to use a rotary dial and either a "ball" dialer or "grooved-knob" dialer is necessary, its metal end may slip from a line button. If no other method of depressing the button can be found, some type of friction tape may be secured to the button top to prevent the metal dialing tool from sliding.

Lever switches, a toggle lever or the enlarged top of the Speakerphone button, can be moved without the use of a projection from the hand. If a projection would prove helpful, however, a pencil may be used, as described for pushbuttons above.

CHARACTERISTICS OF SWITCHES

Where two figures are given for the operating force, these indicate the range of manufacturing tolerances. *All figures are approximations.*

HL=Horizontally operated lever. VL=vertically operated lever. P=Pushbutton.
TL=Toggle lever—the method of mounting determines the direction of its operation.

Switch	**Type**	**Length of Lever**	**Operating Force**		**Distance Moved**
			"On"	**"Off"**	
SWITCHHOOK	P			2 lbs.	¼ in.
DESK TELEPHONE WITH HEADSET JACK, lever modification:	HL	¾ in.	4 oz.	1¼ oz.	1¼ in., through 90°
		1½ in.	2 oz.	½ oz.	2½ in., through 90°
TWO LINE TELEPHONE, lever modification:					
deskset	HL	1½ in.	2 oz.	½ oz.	2½ in., through 90°
		2½ in.	1¼ oz.	⅓ oz.	3½ in., through 90°
wallset	VL	1½ in.	2 oz.	½ oz.	2½ in., through 90°
		2½ in.	1¼ oz.	⅓ oz.	3½ in., through 90°
6-BUTTON TELEPHONE:					
line button	P		9 oz.—2 lbs.		¼ in.
hold button	P		3 lbs.—4 lbs.		¼ in.
SPEAKERPHONE:					
transmitter	P		1 lb. 4 oz.	12 oz.	¼ in.
paddle-lever device (as illustrated p. 23)			12 oz.	7 oz.	¾ in.
4A KEY EQUIPMENT:					
(jack and) key unit	T	unmodified	10 oz.	4 oz.	
		2 in.	6 oz.	2½ oz.	1¼ in.
6017-TYPE key (locking):	T	2 in.	5 oz.	2½ oz.	⅞ in.
6017-TYPE key (non-locking*):	T	2 in.	2 oz.	2 oz.	⅞ in. either way. (total excursion, 1¼ in.)

*used only with Speakerphone.

ANALYSIS: 3) DIALING

Several means of calling a number are available:
A) TOUCH-TONE DIAL (p. 38 and p. 86)
Optional in areas where the service is available.
B) ROTARY DIAL (p. 39 and p. 90)
Universally available.
C) REPERTORY DIALERS (pp. 41-43).
Frequently called telephone numbers are stored on cards or magnetic tape.
D) MANUAL SERVICE
An operator places the call for the patient, a service available only by special arrangement with the Telephone Company.
ONE-NUMBER DIALER
A connection to one party is made by operating a switch.

A) Touch-Tone Dial

Normal Use

The bank of 10 or 12 pushbuttons in a desk set is set at an angle of 30° from the horizontal and pressure to operate the buttons must be exerted along a complementary direction. Two methods of pushing a button are used: The movement may be isolated to the hand and wrist when using pressure from the fingertip, or the wrist and extended finger may be held rigid and the movement take place essentially at the elbow and shoulder. A pressure of 6 to 10 ounces is necessary and may be applied by digit or pencil. Pushing the button causes two musical tones to be generated; when two buttons are pressed simultaneously only one tone is produced and the numbers do not register.

Use by the Physically Handicapped.

When the patient can exert the necessary downward pressure within the space of one button (⅜ in. square) and move his hand over an area 1¾ in. wide by 2½ in. deep, the Touch-Tone dial will be easier for him to use.

The Touch-Tone dial may be particularly useful for the ataxic patient.

An older person, used to a rotary dial, may find difficulty in adapting himself to use the buttons of the Touch-Tone dial.

NOTE: Touch-Tone calling is a system. A Touch-Tone dial is available only in localities where central office exchanges have been wired to provide the service.

B) Rotary Dial

Normal Use

Dialing is accomplished by moving the dial wheel clockwise until the stop is reached, releasing the finger or dialing instrument to allow the dial to return to normal, and repeating the procedure for all the required digits. The dial registers on its return to normal, and unless the dialing is completed within a certain number of seconds, the attempted call will not be completed. (See "Time Available for Dialing," to follow.)

Arm movements to accomplish dialing are of two types. In one, frequently used when standing to dial at a low telephone, the elbow, wrist, and finger are held rigid, with the movement coming from circumduction at the shoulder. In the other method, used more often when standing at a wall telephone or when seated near a desk telephone, muscles of the shoulder act chiefly to stabilize the arm, and the movement is a circumduction of the wrist and extended index finger, occasionally with flexion and extension of the PIP joints.

The pressures needed to move a dial depend on its resistance and on the angle of inclination at which it is mounted. A force of 2 to 6 ounces is needed to move the 9-type dial, available for most desk and wall telephones. In the wall telephone the dial is vertical, in the standard desk telephone it is tipped 26° from the horizontal, and at 15° in a 1008B separately housed dial. The slope of the Princess set is at 20°. These angles of inclination are of importance during use because of the factors of resistance or assistance of gravity and the utilization of momentum.

When the dial of a desk telephone faces the user and "operator" is dialed, the first movement of the dial wheel is "downhill" toward the user, momentum tending to carry it around the arc at the bottom where movement is along the level and gravity plays no part. Force is then applied to move the dial "uphill" against gravity, away from the user. As a position near the top is reached, pressure in a horizontal direction moves the dial across the top; the final movement to the stop is "downhill" and gravity-assisted. The lines of force exerted to move the dial are illustrated (Fig. 10). This also shows that the dialing tool exerts force through nearly all points on its circumference, and that a distinct change of direction in moving the dial occurs at two points, between approximately 7-6 and at 3.

When the non-handicapped person dials, these factors are not apparent to him since he can exert sufficient force to move the finger-wheel around in one continuous motion. The person with less than normal strength will not have this reserve of power; to him, the effects of gravity and the changes in direction assume greater importance.

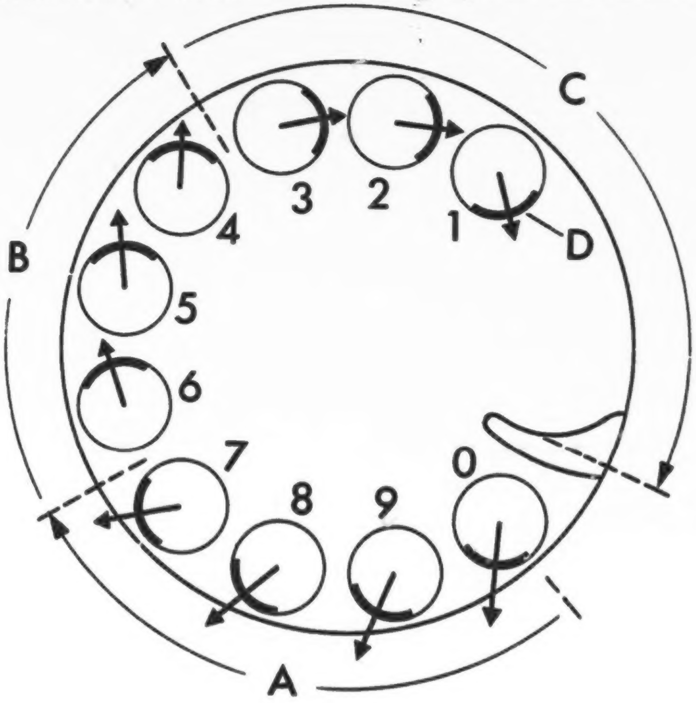
Use by Physically Handicapped.

Dialing is a skill and as such needs practice for its development. It depends not so much on muscle strength as on the appropriate positioning of the hand and arm for mechanical advantage and in timing the movements to exert force at the moment when it will be most effective.

Dialing with the right upper extremity involves motions different from those used in dialing with the left; in some cases, one hand may be used to assist the other.

Despite all tests, it has not been possible to determine the minimum physical function required for the disabled person to use a rotary dial. Two subjects seen in the study illustrate this and are of interest. One was a patient with a spinal cord quadriplegia of some years' standing who had Poor-pluses and Poors in the shoulder musculature and elbow flexors. He wore an ADL long opponens orthosis and with the pencil inserted in a universal cuff across his palm he was able to use a rotary dial easily.

The other subject was a patient with rheumatoid arthritis whose only residual motions were shoulder shrugging, opening and closing her mouth, and a limited movement of two fingers and the thumb of either hand. The remaining joints were fused in extension. She lay propped in a modified wheelchair with a sliding two-level lapboard. When a rotary dial was placed flat and level on the lapboard, she was able to dial. She used a finger in the hole of the dial finger-wheel and moved her arm by shoulder girdle protraction and retraction.



10

FIGURE 10

Lines of force in using a rotary dial. (Diagrammatic)

A. Segment stop-7. "Downhill". Gravity assisted, gain of momentum.

B. Segment 7-3. "Uphill". Gravity resisted, most difficult.

C. Segment 3-stop. Across and "downhill". Neutral gravity, then gravity assisted.

D. Area of finger-hole against which pressure is applied.

Moving a dial that has an upward inclination involves the effects of gravity on the user's arm: resistance during the "uphill" segment and momentum from the "downhill" segments.

Where the normal user tends to execute a continuous circular motion, the disabled person may need to exert force in linear directions: downward in A, upward in B, and horizontally and down in C.

An analysis of the initial tests of physical function gave little indication of the potential of either of these patients. The quadriplegic had developed these skills independently by trial and error and the arthritic required only a dial inclined to correspond with the direction in which she could move her arm.

Since the ability of the patient to use a dial is not predictable, all disabled persons should have the opportunity of attempting to use a rotary dial under the most favorable circumstances. The dial should be placed in the optimum position for height, inclination, distance, and rotation found by observation of the patient's function and by intelligent trial and error. A patient who has been fatigued by earlier procedures and fails in dialing should have the opportunity to try again at another time.

Comparison of Touch-Tone and Rotary Dialing

Where Touch-Tone calling is available, the patient should try the Touch-Tone dial first. The simple action required is particularly helpful to the patient with loss of coordination. All Touch-Tone dials are identical (except for the differences in height and inclination) and require a downward push of 6 to 10 ounces isolated to one button at a time. The appropriate positioning of the dial and suitable technique can be of assistance to the more severely handicapped.

Using a rotary dial, on the other hand, requires skill. The appropriate choice of dial and its positioning for ease of use, together with an opportunity for the patient to learn to employ an appropriate technique, assume greater importance. Attention to these points may enable a disabled person to dial when he has previously considered himself unable to do so. It may also be noted that while the distance the hand moves in using the rotary dial is greater than for the Touch-Tone dial, the force needed is less (2 to 6 oz. compared to 6 to 10 oz.).

Although it is the severely disabled patient who can benefit most from the appropriate positioning of the dial (aligning the arcs of movement through which the dial moves with the planes of movement of the patient's arm function), an understanding of the force vectors involved in dialing can be useful in helping all disabled persons with loss of muscle strength or range of motion.

The physical function of the patient and the physical requirements needed to operate either of the two kinds of dials cannot easily be separated. The method he uses to make contact with the dial (by finger, thumb, dialing tool, or mouthstick), and the method of positioning the dial in response, will differ for each type of dial. Therefore, two testing procedures are outlined: "Procedure for Testing the Touch-Tone dial," p. 88, and "Procedure for Testing the Rotary dial," p. 102. The final choice of dial will depend upon the service available and the patient's ability and preference.

Time Available For Dialing

Calls must be dialed with reasonable alacrity to avoid blocking telephone traffic. Many types of telephone central offices, especially the larger and more modern ones, have built-in ways of reminding callers that they cannot pause or hesitate while dialing. But most able-bodied telephone users are completely unaware of this because the design guideline for telephone central offices is the dialing speed of the average person. The handicapped dialer who dials very slowly may, however, experience difficulty.

The minimum allowable dialing speeds and maximum allowable pauses during dialing will differ from one central office to another. Generally, the telephone user has to start dialing fairly promptly after hearing a dial tone. In most instances he will have only 10 to 20 seconds. In most central offices he will have 20 to 40 seconds to dial seven digits. In some cases he is allowed less than five seconds pause between digits.

If the handicapped person fails to start dialing within the time allowed, he may find his phone has temporarily been taken out of service so that other people's calls can go through. Sometimes a loud howling tone will be placed on the line. This is intended to alert people who have inadvertently left their handsets off the cradle, but it will also inform the handicapped person that he was waiting too long before starting.

If he takes longer than the allowable time to complete the dialing operation, he will in most instances hear the dial tone come on again in the midst of his dialing. The sound of dial tone should warn him to hang up and start over. In certain other cases, the slow dialer will hear a recorded announcement informing him that his call has not gone through as dialed and asking him to try again.

Information on how much time the handicapped person has for dialing, and what occurs if he exceeds that time, may be obtained from the local telephone company.

C) Repertory Dialers

Repertory dialers provide a method of recording and storing telephone numbers so that calls may be placed without using a dial.

In a Magnetic Tape Dialer (such as the Magicall, described on p. 43) the numbers are "dialed into" a tape. Retrieval is achieved by moving the tape belt (by pressing buttons and using a selection wheel) until the number is visible, and then depressing a "call" button.

In the Card Dialer (p. 41, and "Procedure for Testing the Card Dialer," p. 105) a number is recorded by holes punched in a card; insertion of the card in a slot on the top of the set and depressing the "start" bar places the call.

Neither system significantly assists the person who cannot dial because of loss of physical function in the arm, since the person able to manipulate pushbuttons and cards can usually learn to use a standard dial. Nevertheless, there are two important categories of people who can benefit by use of a repertory dialer: those whose physical limitation are not severe but who must use the telephone extensively, and those with disabilities that prevent them from recognizing numbers, from accurately dialing seven numbers, or from exercising control over movement. Those in the second category may be assisted by the Card Dialer.

D) Manual Service and "One-Number Dialer"

If a handicapped person is unable to operate either a rotary or a Touch-Tone dial, it may be possible—depending on local conditions—to make arrangements whereby his dialing is done for him by an operator. This is commonly referred to as "manual service." The handicapped individual moves an easy-to-operate switch, which is the electrical equivalent of picking up the handset. He then gives the operator the number and she dials it for him.

If the handicapped individual's phone happens to be served by a telephone central office where there is a switchboard, both cost and technical problems are minimized. If, on the other hand, he is located at some distance from the switchboard, the usual practice is to run a special line from his telephone to the switchboard. This is called a "toll terminal." The filed tariffs of the telephone companies state the rates for toll terminals, in terms of dollars per mile per month.

If the nearest switchboard is miles away, as is often the case today, the mileage charges for a toll terminal can be appreciable. One way to avoid these line charges is to employ a "one-number dialer." This is a special assembly of equipment which, when triggered by the operation of a switch, automatically dials a predetermined number. If monthly charges for the special assembly are less than the toll terminal charges would be, then obviously the one-number dialer would be preferable.

The one-number dialer can be set to dial "O" for operator, or it is possible to arrange for it to call a telephone answering service where there is 24-hour coverage. While the answering service will not be able to establish a telephone connection for the disabled person as an operator could, the answering service attendant can do the equivalent by calling the desired party and asking him to call back on the disabled person's number. In addition, the answering service attendant can perform many kinds of message-relaying and secretarial services or, by prearrangement, notify a list of people—physician, relative, etc.—whenever an emergency arises. Arrangements can often be made for the answering service to provide, in addition, a reassurance or checkup service (see "Special Facilities or Services for Summoning Assistance," p. 131).

Often the handicapped person lives in a home with members of his family and shares the telephone line with them. A simple arrangement can be provided so that his calls are dialed by the one-number dialer and his family can dial in the normal manner. All that is needed is a device called a "time-delay relay." It can be set to operate after a specified interval of, say, eight seconds. If an able-bodied person picks up the telephone he hears a dial tone and proceeds to dial his own number. If the disabled person operates his telephone switch, nothing happens immediately because he is unable to dial. After eight seconds, however, the time delay relay operates and triggers the one-number dialer. A time-delay relay, like the one-number dialer itself, would be furnished on a special assembly basis.

5.

Evaluation of the Patient: Phase One—Physical Function

The questions suggested under "General Information" are intended to provide the background information for the functional evaluation and equipment tests. The patient's answers should only be noted at this time; a full discussion with him will be more useful after the equipment tests and nearer to the time of final choice of telephone.

GENERAL INFORMATION

Question	**Significance**
Ask the patient:	
Does he use a telephone, the kind of difficulty he has encountered, and the types of telephones he has attempted to use;	An early model telephone may be responsible for the patient's difficulties.
The purpose for which he needs a telephone, and the amount of use he expects to have;	A telephone used for work may need to be a different type than one used for social purposes. The infrequent user may wish to have the most economical equipment.
The location(s) in which he will want to use a telephone, and whether others will wish to use the same telephone.	
"Can you listen with either ear?"	Impaired hearing or deafness in one ear will limit the use of the handset. Either the arm on the side with hearing must be used, or the arm on the deaf side must be capable of moving the handset across to the good ear. Note the patient's answer and later modify the tests if necessary. Impaired hearing in both ears may require an impaired hearing handset.

Does the patient have any visual impairment that may prevent his using a dial, any difficulty in understanding numbers or in following a sequence?	The patient may not be able to use a manual dial. Later he should test the Card Dialer, if feasible (p. 106).
Does the patient have a loss of voice volume?	Later, if feasible, check whether a weak speech handset will be helpful.
Observe the patient's assistive equipment,* and inquire if he uses other devices:	
Examples	
Balanced forearm orthoses	They may imply difficulty in lifting a handset or in pressing buttons.
ADL orthoses	The typing stick may be used for pressing buttons.
Writing cuff	The sequence of operating a telephone may be affected (p. 61).
Mouthstick	The person without arm function who uses a mouthstick need not consider microswitch operation of a telephone since he will be able to use a standard switch (p. 118).
Wheelchair (Information about the patient's use of his wheelchair will be necessary in order to plan a telephone installation, but information obtained at this point cannot be utilized until after he has completed the equipment tests.)	
Note his ability to propel the chair, and whether he also stands or walks.	
Note the type of arm on the chair or whether patient uses a lapboard.	These will be factors in the patient's ability to gain access to a telephone.
Note the patient's trunk balance.	Poor trunk balance will require the telephone to be placed very near to the patient. The patient's need to use one hand to stabilize himself while using the other for the telephone will influence the sequence of actions in telephoning (p. 61).

---

*For a full discussion, see "Assistive Equipment and its Significance for Use of the Telephone," p. 125).

EVALUATION OF FUNCTIONAL MOTION

Two methods of evaluating the patient's functional ability may be used: a *specific evaluation,* that provides a comprehensive understanding of the functional motions of the patient, or a *gross evaluation,* that can reveal the ability of the patient to perform the basic actions involved in using a telephone.

The evaluation of specific function may be used for the patient with a loss of muscle strength or range of motion. It is not suitable for the patient with a loss of coordination—for whom the evaluation of gross function must be used.

EVALUATION OF SPECIFIC FUNCTION (Key Functions are indicated thus*)

Demonstrate and ask the patient to move his arm in:

Motion		**Aspects of Telephoning Affected by Impaired Function**
*Forward flexion		Reaching for the handset, Bringing it to the ear. Putting on a headset.
Abduction:		When the flexors or internal rotators of the shoulder, or the pronators, are weak, abduction may be used for dialing and operating buttons (by allowing the arm to be positioned above the equipment for its weight to be used to apply force).
*External rotation:	Observe range and test strength.	Guiding the arm when reaching forward toward handset, Bringing the handset past the cheek to the ear. Putting on a headset.
*Internal rotation: **(Estimate strength by having the patient press the tip of his finger onto the evaluator's hand.)**	Test strength.	Downward pressure on: Touch-Tone dial, Speakerphone buttons, Line and hold buttons. Rotary dialing from shoulder movement.
*Flexion at elbow:	Observe range and test strength.	Bringing the handset to the ear. Putting on a headset.
Extension at elbow: **(Estimate strength by supporting patient's elbow in abduction—watch for trick movement of rotation plus gravity.)**	Observe range.	Reaching for the handset placed at a distance.
	Test strength.	Using a wall telephone rotary dial. Putting a coin in coin telephone.
*Supination: **(Test when patient rests his elbow on table and holds his forearm upright.)**	Observe range and test strength.	Placing the handset at the ear. Inability to reach the midposition will prevent the most efficient use of a dialing tool during rotary dialing.
*Pronation: **(Test as above.)**	Observe range.	Bringing the hand into position for grasping the handset. Rotary dialing by finger or thumb. Pressing buttons by finger or thumb.
	Test strength.	Dialing by finger or thumb. Pressing buttons.
*Wrist extension:	Test strength.	Employment of a tenodesis grip for grasping the handset.
Wrist flexion: **(Test with forearm on chair arm, in mid-pronation.)**	Test strength.	Pressing buttons.

*If patient has finger and thumb movement, ask him to demonstrate his ability to grasp, to extend his fingers, and to pinch:	Holding handset. Dialing. Using pushbuttons. Using unmodified turnbuttons.
The patient without finger or thumb function may be asked if he has any movement in his fingers. (Isolated poor or trace muscles, or those in which he can induce and control spasm, may be useful for their stabilizing value over a joint.)	
*Test tension in flail finger flexors:	Holding Wear-it-or-Hold-it handset.
Observe whether the thumb of a flail hand is positioned in abduction:	Pressing buttons and Touch-Tone dial. Hooking handset into web of thumb.
Other tests or observations appropriate to the diagnosis or disability.	

EVALUATION OF GROSS FUNCTION

Question	**Significance of the Patient's Performance**
(If the patient has no arm function, refer to p. 115.)	
Ask the patient: "How near to your ear do you think you can get the palm of your hand?"	His performance (refer to p. 69) will show whether he should test first a handset—or "hands-free" equipment for conversation.
If the above arm movement appears adequate, test the patient's grasp or note whether the patient has the potential to employ other methods of holding a handset. (By grasping the handset, hooking it into the web of his thumb, using both hands, utilizing a strap on the handle. Refer to p. 67.)	
Ask the patient to reach forward with his arm and then out to the side.	His performance will show whether he can reach toward a telephone set or whether one with a separate switch will be necessary. The area he can reach will show the sites that will be available for the eventual placement of a telephone.
With the patient's arm reaching forward (as if to a telephone near him), ask him to press his fingers onto the evaluator's hand.	From this pressure, the evaluator estimates whether the patient has sufficient strength in the arm to test depressing buttons or operating a dial.
If the patient is using balanced forearm orthoses, or their equivalent, ask him to move his hand in a circle equivalent in size to the rotary dial.	The patient should always have the opportunity to test a rotary dial, but his inability to move his hand in a circle indicates the liklihood of failure to operate one.

Examine the patient's hand to see whether he can project a finger or thumb past the other digits, or whether he will need a tool for operating switches and a dial.	Where a line button, Touch-Tone dial, or rotary dial require a projecting finger or thumb for their operation, a lever switch or a Speakerphone transmitter can be operated by the side of the hand or wrist.
Employ any test appropriate to the disability.	
Examples	
Spinal Cord Quadriplegia	
Test the strength of pronation, and the laxity or tightness of metacarpophalangeal joints (at the volar and radial aspects) of flail index or middle finger.	Strength in the pronators of a Poor level, without excessive laxity at the MCP joint, indicates potential ability to use a rotary dial by finger.
Ataxia or Spasticity	
Test the patient's ability to place a finger on a specified location.	This ability will be necessary to press a button.

6.

Evaluation of the Patient: Phase Two— Equipment Tests

In the second phase of evaluation, the patient tests the equipment which the preceding functional evaluation had indicated he could use. Telephone equipment is not completely interchangeable and some items can be used only with other compatible, related ones. By utilizing the step-by-step procedure outlined below, the patient need test only the equipment that will match his choice from the preceding step.

Only the significant features of the equipment are summarized here in the Equipment Tests. A complete description of all telephone equipment is given on pp. 13-17.

The Order of Testing the Equipment

Step 1.

The patient considers equipment for conversation and eliminates the types he cannot, or does not care to, use. He tests first either "Handsets" or "Hands-free" equipment, as indicated by the tests of his physical function.

Step 2.

The patient is shown the telephone sets that can be used with the equipment for conversation he is considering and, where necessary, he chooses a type of set that will provide the best method for connecting and disconnecting. (When he cannot reach toward a telephone set, he may test a telephone that has a separate switch, e.g., 4A key equipment. When he cannot depress a push-button, he may consider a set with a lever switch.) He may wish to delay making a decision about the telephone set until he has tested dialing.

Step 3.

The patient tests dials and chooses either Touch-Tone calling (where available) or a rotary dial. Where necessary, he chooses between a dial in a telephone set or the separately housed dial of 4A key equipment.

Step 4.

The patient whose impaired arm function markedly restricts his working area should choose the telephone equipment that provides the most efficient use of space. If necessary, a plan for his work area should be formulated.

Step 5.

The final choice of telephone equipment is made by taking the general factors of the patient's use into account. These factors are summarized on p. 124.

Positioning the Test Equipment

Any piece of equipment must be placed at proper height, must operate in the direction in which the patient can exert his greatest force, and must be firmly stabilized (by the evaluator if necessary) as he uses it. A wheelchair should have the brakes applied. These factors may be critical when it is the first time that the patient has tried to use a telephone. After he has developed skill in its use, the exact position of a telephone may become less important.

Testing Equipment for Conversation and Choosing a Telephone Set

TESTING HANDSETS:

G3 standard handset, Wear-it-or-Hold-it set as a handset.

The two handsets are not interchangeable; each is used only with certain types of telephones. Therefore, the preference for either standard handset or Wear-it-or-Hold-it handset specifies the types of telephone sets available to the patient. (After making this decision, the patient, when necessary, then chooses between these sets by choosing the type of switch—for answering and disconnecting calls—that best suits his physical ability.)

The patient should test both handsets so that he may have the opportunity of comparing them.

A handset should be placed within the patient's reach with the handle aligned appropriately for his grasp. He may need to test lifting the standard handset from the table before attempting to take it from the cradle of the telephone set.

Preference for Standard Handset

When the patient can take the handset off and replace it on the cradle with ease, no switch will be necessary and testing the rotary dial (or Touch-Tone dialing system, where available) is the next procedure.

When the patient can use the handset, but prefers to leave it off the cradle (and therefore off the switchhook), another method of switching will be necessary. The following telephone sets may be used:

1) By lever switch modification, requiring horizontal movement: *Two-line desk telephone* (see p. 16 for the operating force required). The lever may be 1½- or 2½-in. long.

2) By pushbutton, requiring downward movement: *6-button desk telephone* (with square buttons, see p. 17 for the operating force required). Also appropriate: *6-button set with headset jack* (p. 25), *6-button Card Dialer,* if desired (p. 41).

If a 6-button telephone is to be used in a business and it is necessary for the patient to use the hold button, the excessive pressure necessary for its depression may be reduced by a hold-lever device, p. 18.

After selecting the telephone set, proceed to dialing. Choose between the rotary or Touch-Tone system of dialing, where available.

Preference for Wear-It-Or-Hold-It Handset

The Wear-it-or-Hold-it set needs a particular circuit arrangement and can plug into only two types of telephones:

1) Telephone Sets (with integral switch):

Operated by lever switch modification, requiring horizontal movement: *desk telephone with headset jack* (see p. 25 for operating force required). The lever may be ¾- or 1½-in. long.

Operated by pushbutton (requiring downward movement) or lever switch modification (requiring horizontal movement): *6-button desk telephone with headset jack* (p. 25); *Card Dialer* with headset jack and/or 6 buttons, if desired (p. 41).

2) Telephone with Separate Switch:

Operated by toggle lever (the direction of movement is determined by the placement of the key): *4A key equipment* (see p. 27 for operating force required). The lever may be 2-, 3-, or 4-in. long.

If a 6-button unit is needed, the externally mounted 6050 key may be used (special assembly) (see p. 28).

The final choice between a desk telephone and the externally mounted components will be determined by the preferred housing for the dial and influenced by the "General Factors" discussed on pp. 58-66. Proceed to dialing. Choose between rotary and Touch-Tone system of dialing where the latter is available.

TESTING "HANDS-FREE" EQUIPMENT

Speakerphone, headsets, handset-holding devices.

"Hands-free" equipment is indicated for:

The patient who is unable to lift the handset or to control his arm.

The patient who finds a handset too tiring for frequent use.

The patient who needs a free hand for taking notes, referring to papers, or operating hold and line buttons.

Special switches: In the rare cases where a microswitch is found to be essential, first consult "The Person Without Arm Function" (p. 116), and then proceed as indicated by the test of equipment for conversation.

Speakerphone (p. 21)

Modifications:

The "on-off" buttons may have enlarged tops added or a paddle-lever device may be used.
The volume-control knob may be replaced by a wheel.

Substitutions:

A 6017AA key, microswitch, or other switches, may be used. (Because they are separated from the transmitter, these switches may be placed in any position convenient for the patient.)

A separately housed dial may replace the standard telephone associated with the Speakerphone.

The Speakerphone is unsuited to:

Noisy locations, the need for privacy, economy in cost.

After choosing the Speakerphone, proceed to dialing. Choose between the rotary or Touch-Tone dial where the latter is available. If desirable, consider whether to keep the standard desk telephone or to replace it with a separately housed dial.

Headsets

Lightweight Headset (p. 31).

Clipped on to headband or eyeglass frames, employs an earplug and auxiliary clip-on amplifier. Simple for an assistant to place on the user. The preferred headset because of its light weight.

Headband:

To be placed on the head, this needs the use of both hands with enough strength to pull the headband sides apart. There must be ability in the arms to place the hands above the ears.

On eyeglass frames:

The lightweight headset should remain attached to the frames as the clip is too stiff to move on and off easily. Most patients who can put on eyeglasses can use this headset.

Earplug:

When correctly adjusted (p. 33) it may be pushed in place by the user's thumb, fingertip, or PIP joint.

Clip-on Amplifier:

May be placed into breast pocket or clipped to blouse or shirt. The stiff clip cannot be used by one with less than normal strength in the hand. When it is to be used in a pocket, its cords should be taped together (p. 33).

Operator's Headset (p. 33).

Used on headband. Its four adjustments are complex for an assistant to place on a disabled person's head. For the patient to place it on himself requires mental alertness, either one arm of normal range of motion or muscle strength, or the ability to place the fingertips of both hands above the ears. Suited to the patient who prefers the most economical equipment.

Wear-it-or-Hold-it Set as Headset (p. 29).

Due to its weight this has very limited use. Suited to the one-handed person who wishes to take notes, etc., only occasionally. Using it as handset, when the occasion arises, he can hook the headband over his head to free his hand.

After choosing a headset, see "Preference for Wear-it-or-Hold-it Handset," p. 85, for related telephones and the procedure for choice of dial.

Handset-Holding Devices *(commercially available equipment)*

Sparr Arm (p. 35).

A gooseneck arm, for holding a Wear-it-or-Hold-it handset, which clamps to desk or table. Suitable for use in a stationary position by the person who can move his head toward it and away.

See "Preference for Wear-it-or-Hold-it Handset" (p. 85) for related telephones and the procedure for choice of dial.

Luxo Arm (p. 36).

A movable spring-counterbalanced arm holding a standard handset. Suitable for the person able to move and hold a comparatively weightless handset to his ear. It is also useful when working space is limited.

See "Preference for Standard Handset" (p. 85) for related telephones and the procedure for choice of dial.

Shoulder Rest (p. 37).

This clamps to a standard handset for holding between shoulder and head. It is suited to the limited number of one-handed persons on whose shoulders it will stay.

See "Preference for Standard Handset" (p. 85) for related telephones and the procedure for choice of dial.

Testing Dials

Touch-Tone dial, rotary dial, Card Dialer.

TOUCH-TONE DIAL

Methods of Making Contact With the Touch-Tone Dial

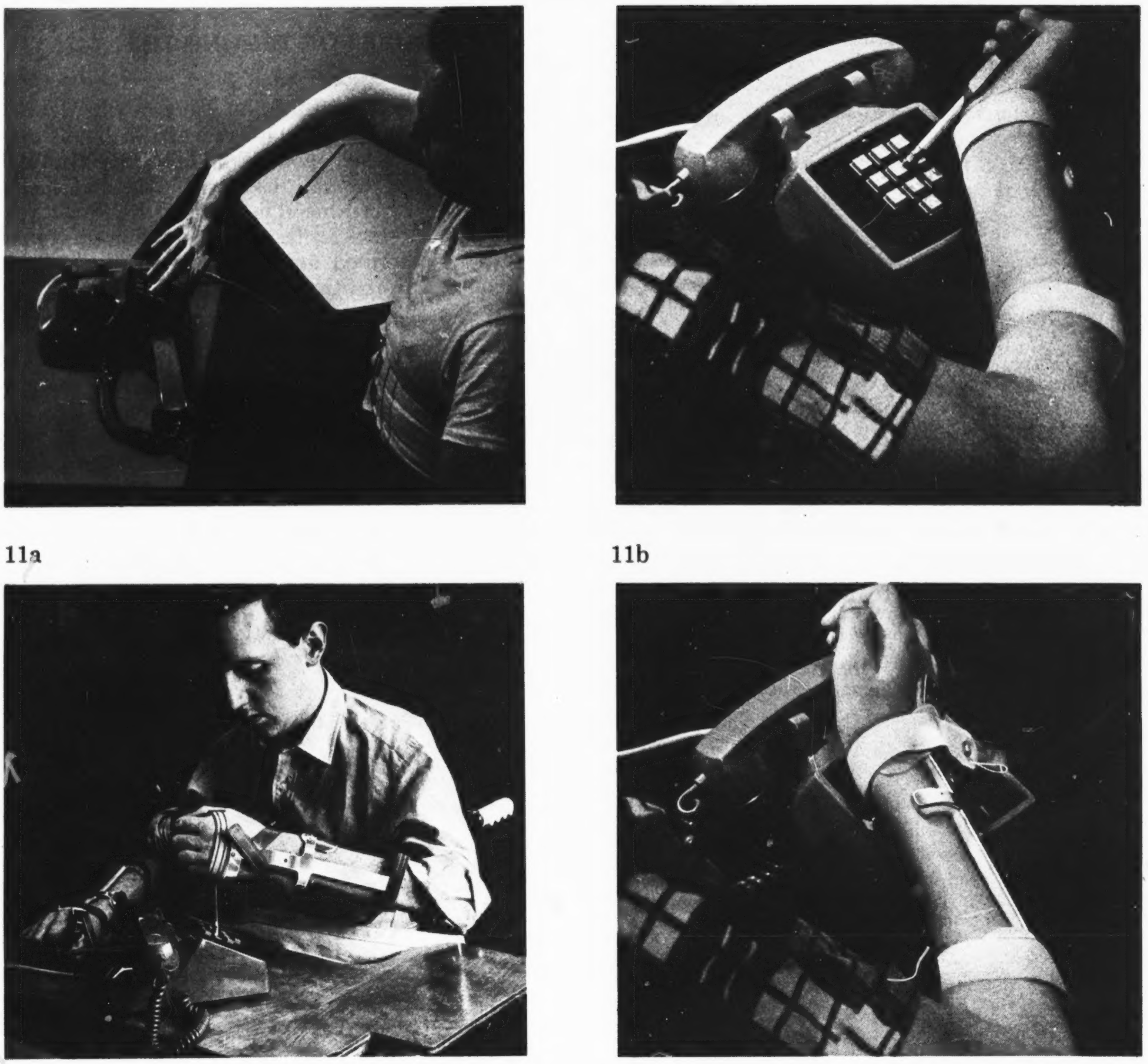
By Finger or Thumb.

Because the movement required to depress the button is a pressure in only one direction, a paralyzed finger or thumb may be used successfully for this. Force can be exerted from the elbow and the shoulder, provided the joints between the source of power and the tip of the finger or thumb are sufficiently stable to transmit the force (Fig. 11a).

The ataxic patient who can control the movement of his arm by stabilizing his wrist against the telephone set, or the surface on which it stands, may be able to use his finger on the buttons.

By Pencil.

When the patient has sufficient strength in his arm to depress a button but his hand lacks the



11a

11b

11c

11d

FIGURE 11

Methods of contacting the Touch-Tone dial.

(11a) By finger. Dialing is not prevented by loss of strength in the fingers when the wrist is sufficiently stable to transmit the force exerted by the arm.

(11b) By pencil. The person without muscle strength in the fingers or wrist may have a universal cuff placed over his hand and a pencil placed in its pocket. This patient has little strength to press downward but he is able to use a Touch-Tone dial. He is able to flex his elbow and shoulder, and then by relaxing, allow the weight of his forearm to depress the button. Since he cannot change the angle at which the pencil projects downward, he is unable to push into the face of the button and must push on its edge instead.

(11c, d) A downward pressure of between 6 and 10 oz. is needed to depress Touch-Tone buttons. When the arm has insufficient strength or weight for this, power from the elbow flexors may be used to augment the force. The pencil is placed on one side of the button and movement of the forearm across the button transmits these forces to the button. (The action shown here appears to be pronation, but this is deceptive; the pronated position has resulted from flexing the elbow against a lever, i.e. the pencil.) Note the position of the dial; it is placed to take advantage of the direction of the force from the user's strongest movement: elbow flexion.

(a. Spinal Cord Quadriplegic, Group E.)
(b. Spinal Cord Quadriplegic, Group B.)
(c. Spinal Cord Quadriplegic, Group B.)

ability to project a finger or thumb past the other fingers (despite positioning the dial to eliminate any obstruction from the housing) the eraser end of a pencil may be used. If he cannot hold the pencil, a universal cuff (p. 47) may be employed. Should he have a hand orthosis of the appropriate type, the pencil may be inserted into its spring clip or pocket.

When downward pressure from the hand is insufficient to depress the button, the weight of the arm may be used. The person lifts his arm above the button and relaxes it to transmit its weight to the pencil end (Fig. 11b). This method is not suitable if the arm is short or slender, as sufficient force cannot be exerted and a means of augmenting it is necessary. When the person can flex his elbow, its force can be added to the leverage (Fig. 11c, d). The arm is positioned to one side above the dial and the pencil eraser end is placed on the faceplate at the side of the button, or on the button itself. The arm is brought across the dial so that either the shaft of the pencil exerts leverage against the edge of the button to depress it or the force from the weight of the arm moving horizontally overcomes the resistance of the button. Any movement the person can employ may be used in this manner, and the set should be placed accordingly.

A person unable to exert a steady pressure of sufficient force may find he is able to depress the buttons by hitting them with a pencil held in, or secured to, his hand.

By Parts of the Body Other Than the Hand.

Only two patients in the study were seen to use other body parts to depress a button. One, disabled by athetoid cerebral palsy, without use of his arms but with good use of his legs, used his great toe to dial. The other was a patient with congenital amputations at her elbows who could use the bony projection of one stump when she was not wearing her prostheses. It is possible that a person unable to use his hands, when the tip of his elbow is sufficiently prominent, could use his elbow to depress the buttons of the Touch-Tone dial.

By Mouthstick.

Both the severely disabled person using a mouthstick, and the one who has no arm function but can write by holding a pencil in his mouth, find the Touch-Tone dial excellent.

By a Special Lever.

A lever device can be constructed for depressing "0" and thus reaching the operator. It will assist the person with strength in his arm but who is unable to exert pressure on only one button at a time (see p. 38).

PROCEDURE FOR TESTING THE TOUCH-TONE-DIAL

When it appears that the patient can depress the buttons of the Touch-Tone dial with his finger or thumb, the telephone should be placed in front of the hand he will use, with the dial facing squarely toward his elbow. When he is not successful, positions for the dial other than this orientation (described under "Rotation," to follow) should be tested through trial and error.

When it is decided that a pencil is needed, and the patient is unable to hold one, a universal cuff can be employed to secure the pencil in his hand.

The patient who will be using a telephone with headset jack has the choice of desk telephone or 4A key equipment. The decision as to which is more appropriate for him will be influenced by his performance on a dial; in some cases, because of its lower height and flatter inclination, the separately housed dial is more satisfactory than a dial mounted in a desk telephone.

In positioning the dial, the following factors should be considered:

Positioning the Touch-Tone Dial

The buttons on a desk set depress downward at an angle of 30° from the perpendicular. On a separately housed dial the angle is 15°. As pressure is most efficient when applied squarely to the button, the dial should be placed so that the action of the button corresponds in direction to the movement employed by the patient.

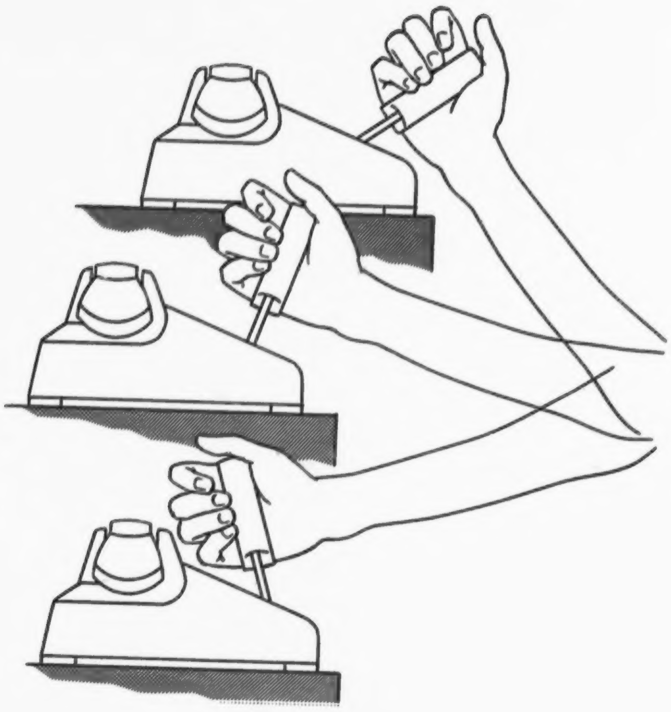
In cases where the patient's thumb or finger slips off the face of the button, he may do better by pushing on its edge.

Height and Inclination.

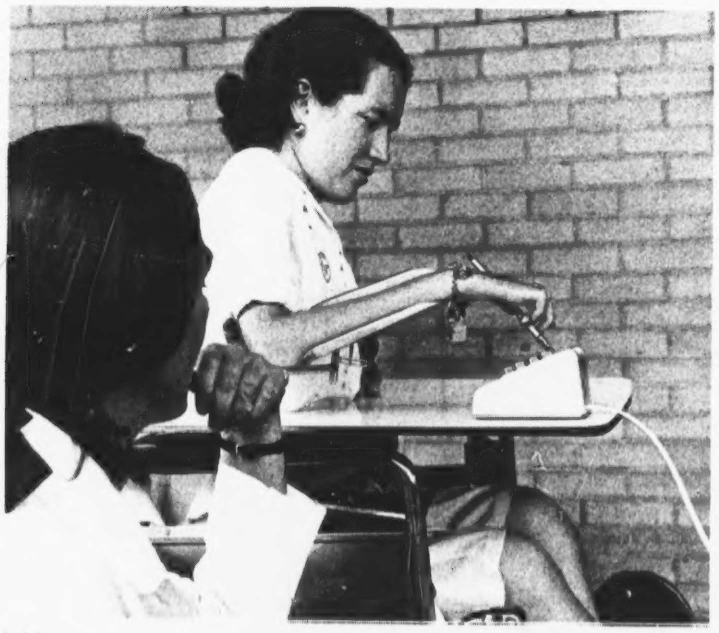
Adjusting the height of the dial, in effect, alters its inclination relative to the patient's arm (Fig. 12a). When a low position is preferred to enable the patient to exert his greatest force (helpful to the person using a balanced forearm orthosis) the inclination that results may be inappropriate (Fig. 12b). If a horizontal position of the bank of buttons seems advantageous, this may be achieved by propping up the dial.

When the height and inclination of the dial relative to the patient need to be adjusted, a sighting taken from the side at the level of the set during the patient's use will indicate the optimum position (Fig. 12c). After he has practiced with the dial in this position, an attempt should be made to replace the set in a normal position. If, after testing different rotations, this tilted position is the only one by which the patient can succeed in dialing, a permanent block on which to rest the set may be considered.

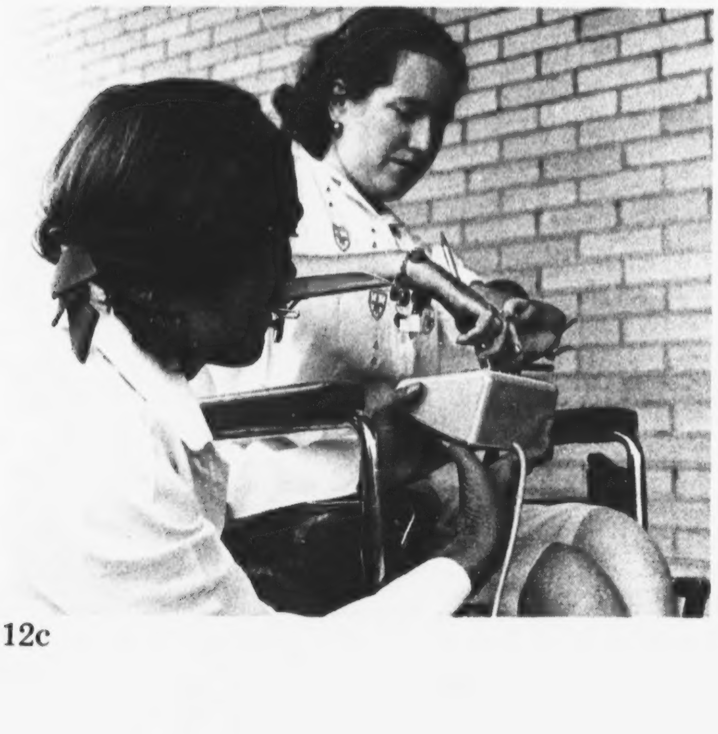
When the patient is able to push only in a hori-



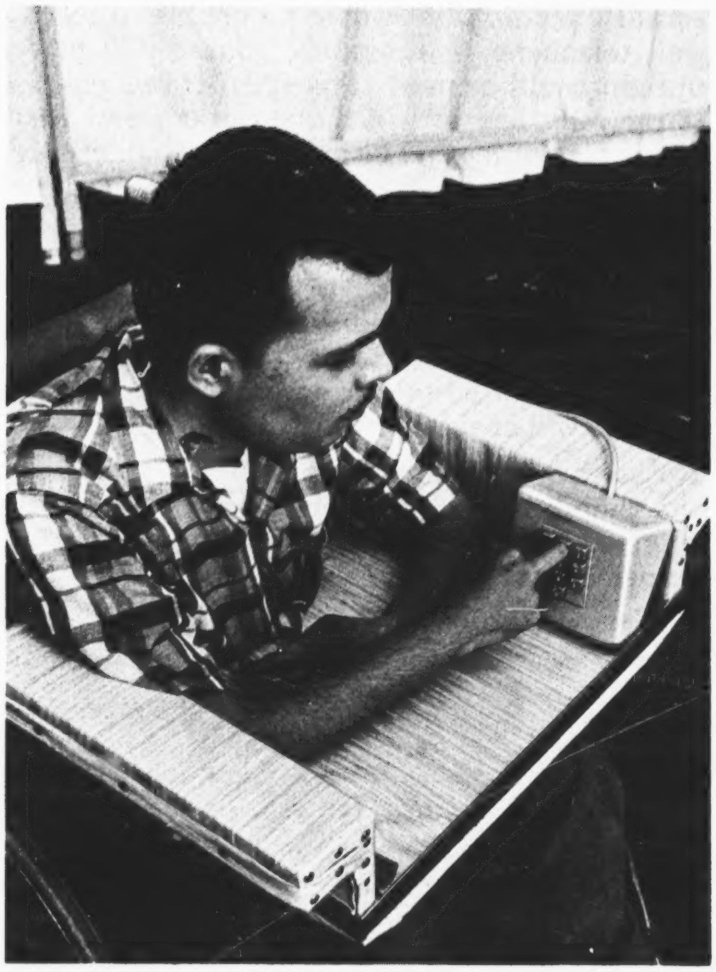
12a



12b



12c



12d

FIGURE 12

Height and inclination of the Touch-Tone dial.

To allow the user to exert the greatest force possible on the buttons, the dial must be at the correct height and inclination.

(12a) Adjusting the height of the dial has the effect of altering its inclination as related to the user's arm.

(12b) The user of a balanced forearm orthosis may find a low position of the dial advantageous. The height illustrated is too high and the buttons cannot be depressed.

(12c) By making a sighting from the side, the best height and inclination of the dial may be found. The optimum position allows pressure to be applied squarely onto the buttons.

(12d) This patient maintains his arms in this position and is able to push only in a horizontal direction. He would be unable to reach the vertical dial of a wall phone but would be able to use a separately housed Touch-Tone dial mounted upright.

(b. Postpolio.)
(d. Muscular Dystrophy.)

zontal direction, but would be unable to reach a wall telephone, a separately housed dial placed upright could be used (Fig. 12d). If this position is the only one in which the patient can use a dial, a platform could be made that would provide the appropriate permanent mounting for such a dial unit.

Rotation.

Before deciding that the patient must contact the edge of the button rather than its face, the dial should be rotated to discover whether a different position will enable him to push squarely into it.

Rotation of a telephone set may be essential when the thumb is used and the other fingers are obstructed by the cradle posts. In this case the set is turned sideways (Fig. 13c, d).

When a projection of a hand orthosis is used, it may be most desirable to turn the set completely around to face away from the patient (Fig. 13e, f).

When a telephone set is positioned for best use of the dial, the standard handset on the telephone may not be in proper alignment with the patient's grasp and thus prevent him from lifting it from the cradle. When a position cannot be found that allows use of both dial and handset, a telephone with a switch (for example, a two-line telephone with lever-modification) may be helpful. This will allow the patient to leave the handset in a convenient position off the cradle.

ROTARY DIAL

While a wall phone can only be mounted with the dial facing in a set direction, the planes of movement of the dial of a desk set (relative to the user) can be changed by repositioning the telephone base. In this way, those arcs of movements of the dial that take most effort to move through may be aligned to correspond with the arcs of movement in which the patient can exert most force.

In order to describe some methods of altering the position of the dial relative to the arm of the disabled person, the following designations are used, and their implications discussed (Figs. 14 and 15).

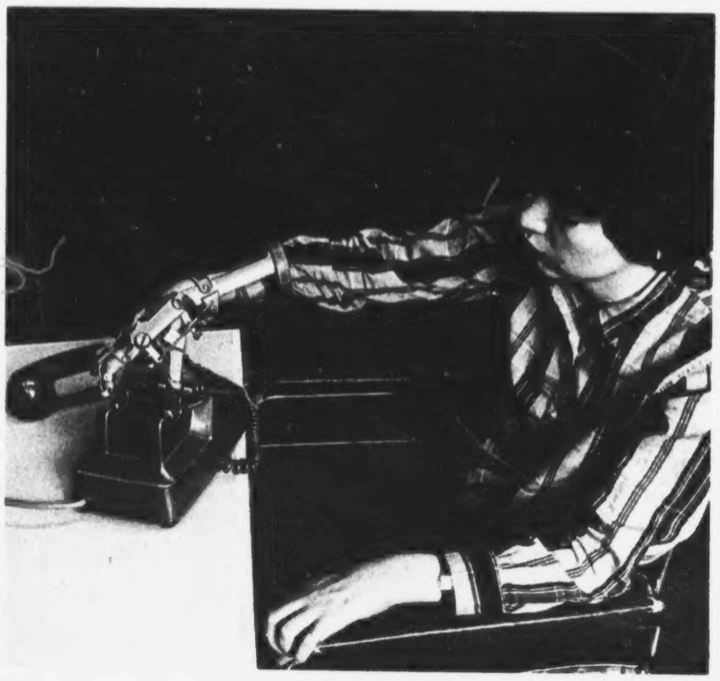
Designations of Terms for Positions of the Arm and Dial

The Arm.

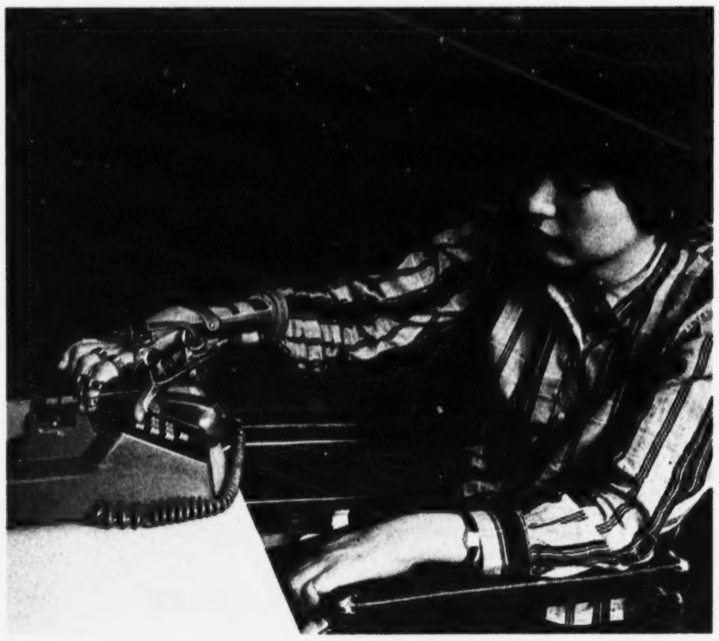
"*Forearm Axis.*" This line drawn from the elbow through the wrist and hand is the fixed reference to which all other positions relate. A clock face may be imagined as being attached to it: the person's hand points always toward 6 o'clock and the elbow toward 12 o'clock, regardless of the direction taken by the arm. The forearm axis is horizontal or tilted slightly upward during dialing, but when the elbow is raised so the forearm points

13a

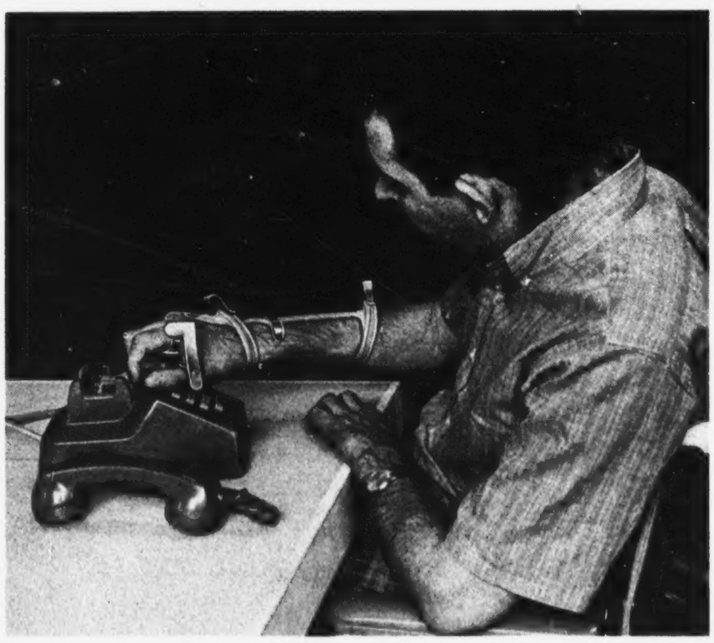
13b



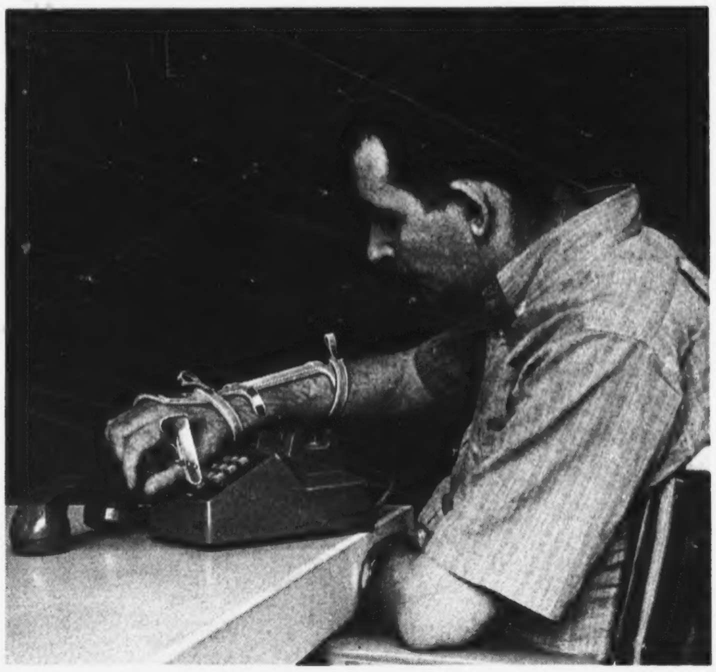
13c



13d



13e



13f

downward, the 12–6 orientation is considered to continue.

"*Dialer Line.*" A finger, thumb, or dialing tool will project at an angle from the forearm axis, and the line between its tip and the forearm axis is designated the "dialer line." It will usually point downward toward the surface of the table on which the dial stands, but depending on whether it points to left or right of the line, will be considered as pointing toward (approximately) 9 o'clock or 3 o'clock. When the extended finger of the palm-down hand is used, it points forward and is considered pointing toward 6 o'clock (Fig. 14). (The dial that faces squarely to these positions will face toward 3, 9, or 12 o'clock.)

"*Dialing Tip.*" The use of a finger tip, thumb tip, or dialing tool in the holes of the dial finger-wheel will be specified as necessary, and the term "dialing tip" is designated as one that covers the use of any object in the dial hole.

The Dial.

Inclination. The angle between the plane of the dial face and the horizontal is termed the "inclination" of the dial. This angle varies according to the type of set in which the dial is mounted. Thus a separately housed dial at 15° is flatter than a dial mounted in a desk telephone (26°).

FIGURE 13

Rotation of the Touch-Tone dial.

(13a) The hand in a tenodesis orthosis opens during wrist flexion, and the projecting thumb may be used for depressing the Touch-Tone buttons.

(13b) When the hand is closed by extending the wrist, the thumb is positioned next to the fingers and cannot be used to depress one button of the group.

(13c) With the dial in a straight position, the cradle posts obstruct the patient's fingers and she cannot reach the buttons with her thumb. She cannot move her fingers away by wrist extension since this will move her thumb next to her fingers and prevent its use on a button.

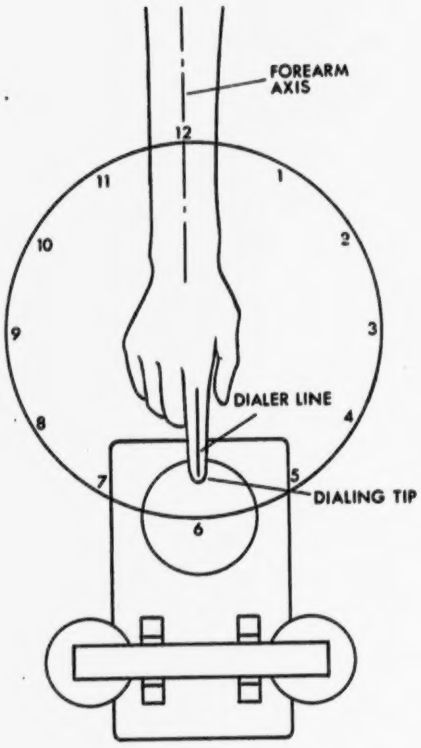
(13d) Rotating the base of the telephone allows space over the edge for her fingers and she can use her thumb to depress the buttons.

(13e) This patient cannot use his flail fingers or thumb to depress the buttons but he could use a projection of his hand orthosis. The angle of the dial, however, does not allow him to reach the buttons.

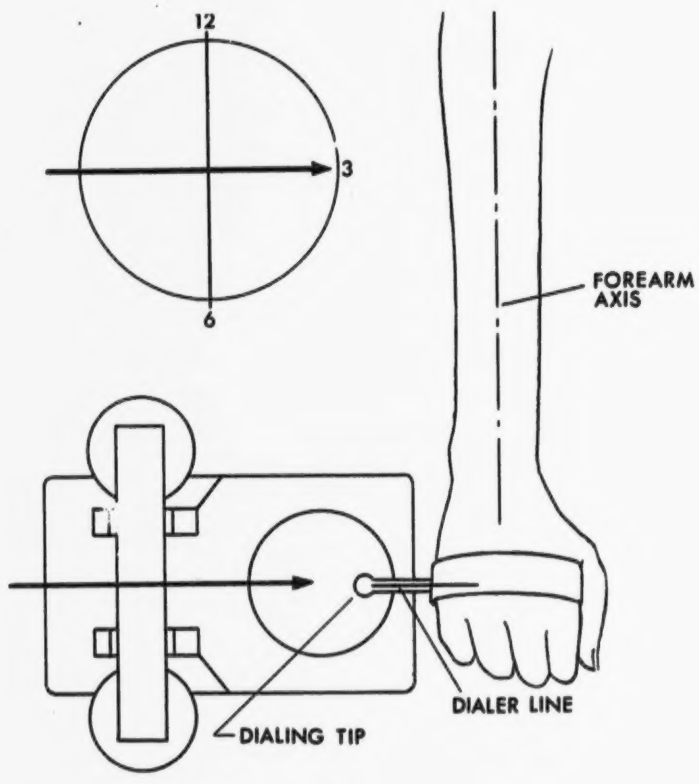
(13f) When the set is rotated so that the inclination of the dial face is parallel to his arm, the opponens bar of his orthosis can reach the buttons.

(a. Spinal Cord Quadriplegic, Group D.)

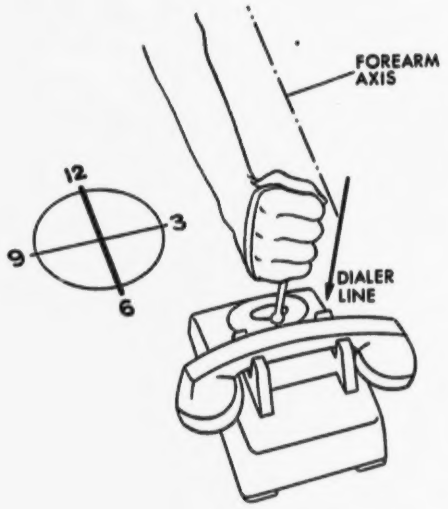
(c. Spinal Cord Quadriplegic, Group C. This patient would not use a standard handset.)


FOREARM AXIS
12
1
2
3
4
5
6
7
8
9
10
11
DIALER LINE
DIALING TIP

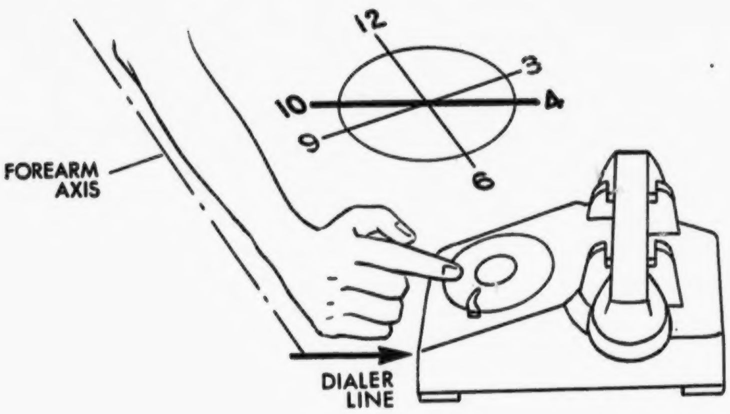
14a


12
3
6
FOREARM AXIS
DIALER LINE
DIALING TIP

14b


FOREARM AXIS
12
3
9
6
DIALER LINE

14c


12
3
10
4
9
6
FOREARM AXIS
DIALER LINE

14d

FIGURE 14

Positioning the dial: Designation of terms.

The fixed reference line is the "forearm axis", a line from the elbow through the wrist. An imaginary clock attached to it always points to 12 o'clock at the elbow and 6 o'clock at the hand. The time on this clock to which the dial faces is used to describe the orientation of the telephone set as it is placed initially in position for use.

(14a) When the "dialing tip" (here the extended finger of the pronated hand) points toward 6 o'clock, the set will be initially positioned to face toward 12 o'clock.

(14b) To allow a dialing tip (here a dialing tool attached by cuff to a pronated hand) to make contact with the holes of the finger-wheel, the set must be placed to face squarely toward the "dialer line" (the line from forearm axis to dialing tip). As this dialer line faces toward 3 o'clock, the set faces toward 9 o'clock.

(14c) The dialer line of a dialing tool secured to a hand held in the mid-position points downward and thus may be regarded as facing toward 6 o'clock. The set faces toward 12 o'clock.

(14d) A finger that points toward 4 o'clock, such as the extended finger of the hand maintained in mid-position, requires the set to be placed facing toward 10 o'clock.

The importance of the inclination lies in the effect of gravity on the user's arm. A steep dial forces the user to move his arm upward against gravity, whereas a completely flat dial requires movement only in a horizontal direction. A flat dial, however, does not provide the assistance of momentum as does the inclined dial during the initial movement downward from "0."

A compromise between the resistance of gravity "uphill" and the assistance of momentum "downhill" is provided by the 1008B separately housed dial and this should be used for testing when the patient has difficulties with the dial in the desk telephone.

Rotation.

If a desk set, or 1008B separately housed dial, resting flat on a table were to have an axis perpendicular to the table through the center of the dial, movement of the set around this axis would be "rotation." Another vertical axis around which the dial may be rotated is one through the stop. Rotation allows the dial to face in any direction and the inclination is not changed (Fig. 15). (It does not refer to movement of the dial finger-wheel, which remains at rest.)

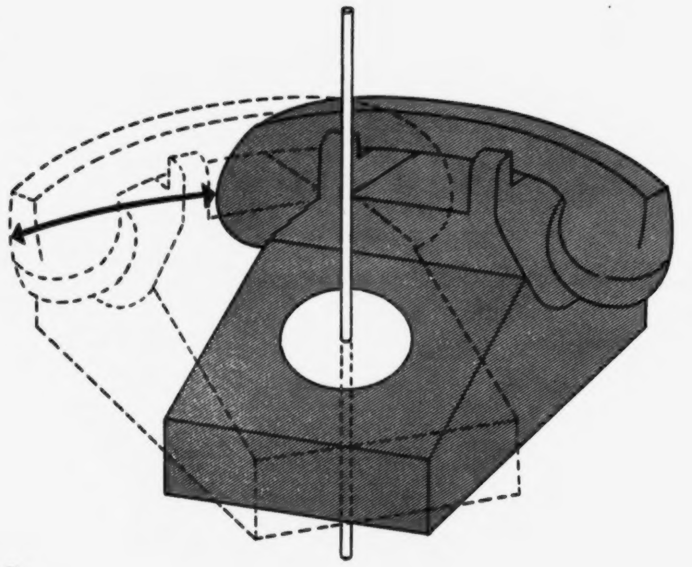
The direction faced by the dial is a function of relationship to the forearm axis: a dial placed square to the forearm axis would face the elbow and be considered as facing toward 12 o'clock.

(It has already been noted that movement of the dial wheel from "0" can be divided into three segments (see Fig. 10, p. 76) and that as segment 7–3 involves pushing "uphill" and away, it is the hardest one to execute. The purpose of adjusting the rotation of the dial as related to the user's arm is to assure that the plane of the arc through which a dial hole moves corresponds with that of the arc made by the dialing tip and arm, and to arrange that the resistive segment 7–3 is encountered by the arm in that portion of the arc where arm movement is strongest. *Example* (Fig. 16). The quadriplegic with partial function only in his elbow flexors and shoulder musculature, needing to use a "ball" dialer, may find difficulty in pushing uphill and away in segment 7–3 of the dial. If the dial is turned completely around to face away from the forearm axis, segment 7–3 will occur in movement toward him during elbow flexion, his strongest movement).

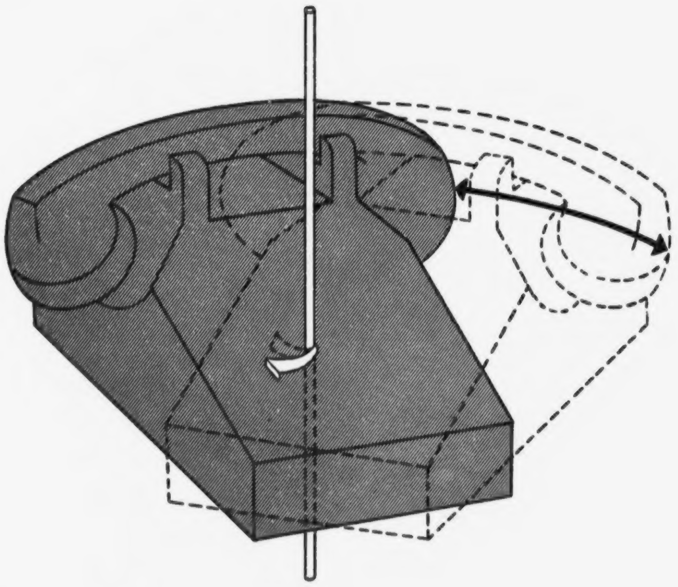
Initial Dial Position.

This describes the initial orientation of the dial to the forearm axis as the set is placed in front of the disabled person for him to test. It is determined chiefly by the direction in which the dialing tip points from his hand, i.e., to allow the dialing tip to be placed in the dial finger-hole. Adjustments around this starting position are made during the patient's attempts to use the dial.

(The procedure for positioning the dial is ex-



15a



15b

FIGURE 15

Adjustments in rotation: The axes of the dial.

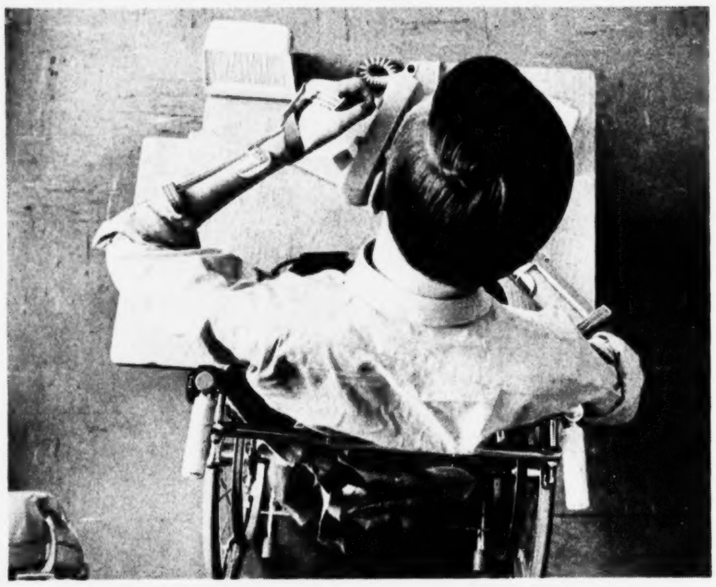
After the initial placement of the set, further adjustments in its position are made by rotating the set as needed. The purpose is to assure that the arc through which the dial finger-wheel moves corresponds, in its segment and plane, with the arc through which the disabled person's arm is capable of moving the dialing tip. Two axes are used in obtaining this correspondence.

(15a) Axis through the center of the finger-wheel.

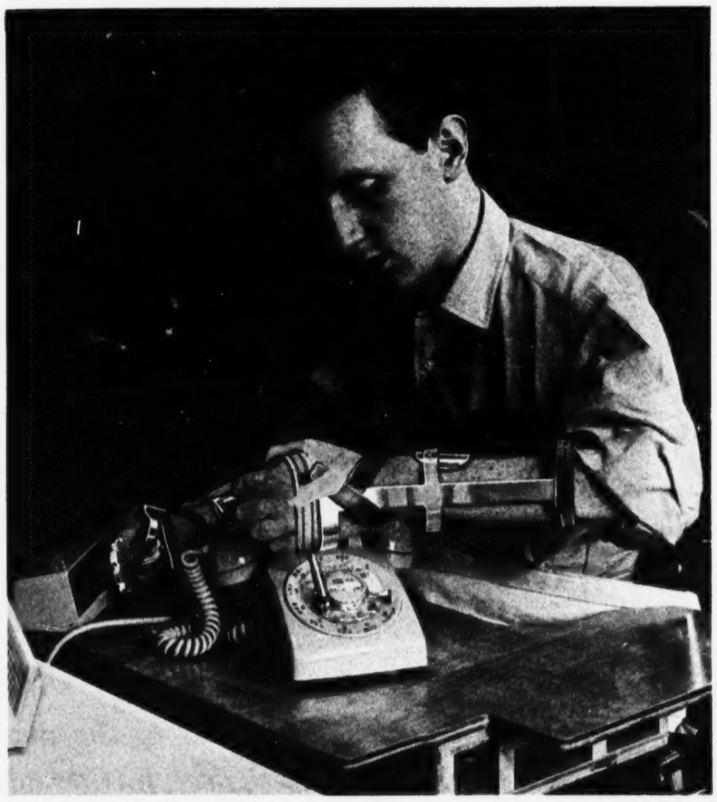
Rotating the set around this axis is used to bring the stop to the place that the disabled person is able to reach and, by altering the starting point for dialing, to alter the momentum gained "downhill" from "0".

(15b) Axis through the stop.

Moving the set around this axis is used to align the planes of the dial and the dialing tip. This rotation will move the entire side of the dial with the "uphill" segment 7-3 toward or away from the dialing tip.



16a



16b

FIGURE 16

Rotating the rotary dial completely around.

The most resistive segment of movement of the dial finger-wheel is from 7 to 3. When the dial faces the elbow, the user's arm must move upward and away. The person unable to exert force in this direction may have the dial rotated completely around. The difficult 7–3 segment will then occur when he brings his hand and dialing tool toward him during the stronger movement of elbow flexion.

(Spinal Cord Quadriplegic, Group B.)

plained fully in "Procedure for Testing the Rotary Dial," to follow.)

Methods of Making Contact With the Rotary Dial

Dialing Tools

Where a patient cannot dial by using his finger or thumb, yet has sufficient strength and control in the arm potentially to move the dial, a Bell System dialing tool, or a commercially available one, may be used. A pen or pencil can be used, but neither is as efficient as instruments designed for the purpose. While the rubber eraser helps to prevent a pencil from being dislodged from the hole of the dial finger-wheel, the rubber adds resistance during operation of the dial. Using a pencil with the eraser removed will damage the dial number plate. Therefore, it is preferable to use either the Bell System "ball" dialer, or the short "ball" attachment (Fig. 17).

Two kinds of commercially available dialing tools have been found useful. The patient should have opportunity to test both of them.

The "ball" dialer (p. 44) assists those able to maintain a downward pressure on the dial (Fig. 17a). This dialer is the easier to use since the ball rotates with the finger-hole and friction is materially reduced. A secure anchorage in the hand is necessary.

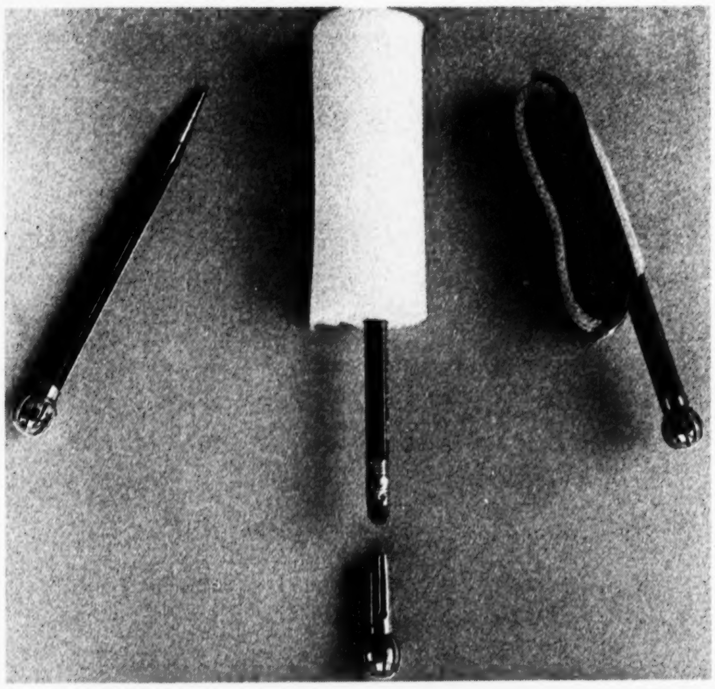
The "grooved-knob" dialer (p. 46) assists those unable to maintain a downward pressure (Fig. 18). (The flange of the dialer lodges on the edge of the hole of the dial finger-wheel and prevents it from slipping out.) When the dialer is held in the hand, the arm must be able to follow the upward inclination of the dial to prevent the dialer from jamming.

Patients without function at the shoulder and elbow but who are able to move the hand by circumduction at the wrist (for example, a patient with muscular dystrophy) may use the "grooved-knob" dialer without grasping it. The dialer is placed in a hole and the side of its shaft is pushed around to the stop by the fingers.

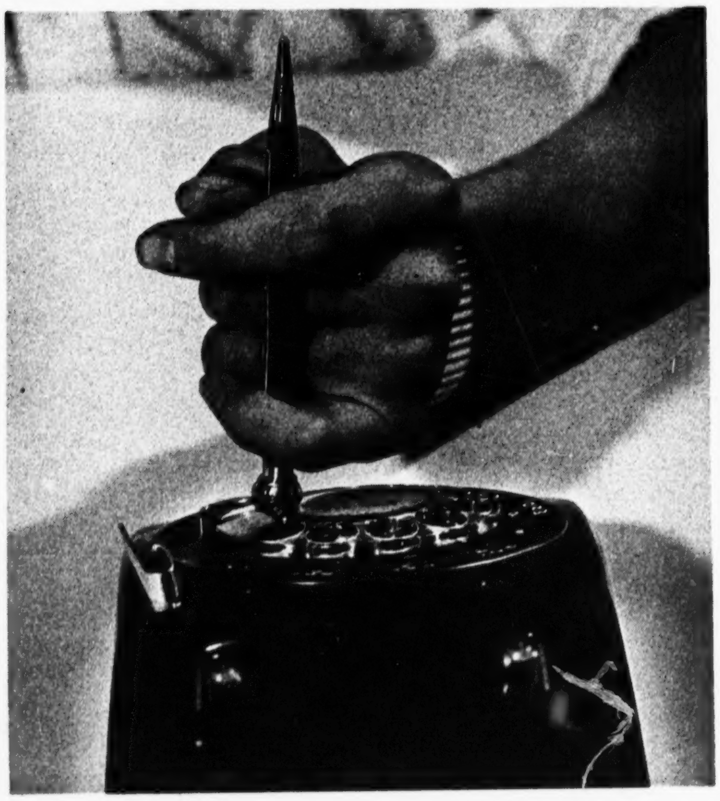
A "grooved-knob" dialer is not suitable for the person who cannot control his arm because the tool may jam and break the dial finger-wheel.

The illustration of the changing direction of force during dialing (see Fig. 10, p. 76) showed that it was applied around all of the circumference of a dialing tool. Unless a "ball" dialer is securely held, it may be easily dislodged.

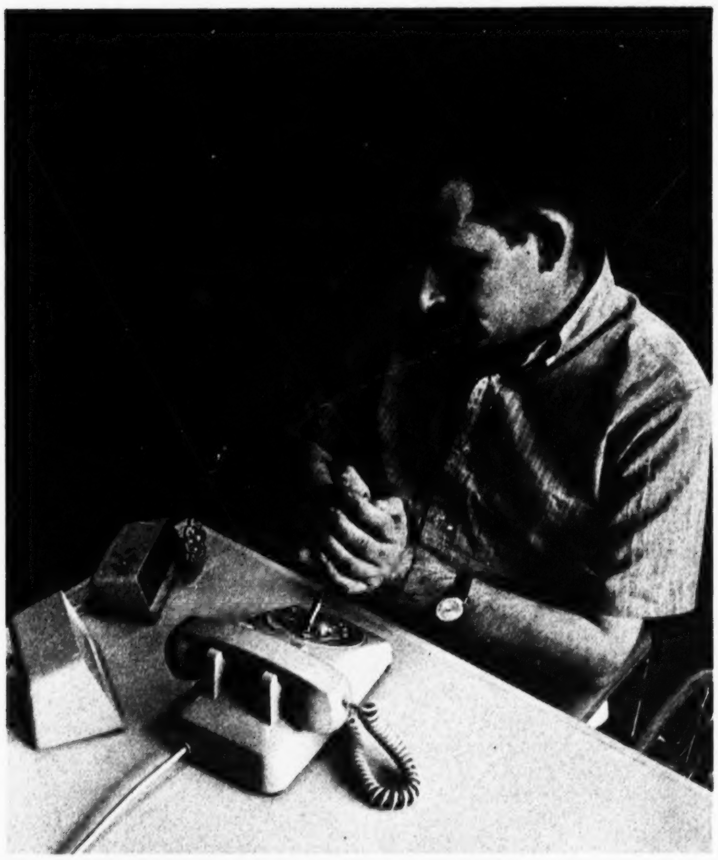
The person whose grasp is too weak to prevent the dialing tool from dislodging may occasionally find that lacing the dialing tool through the fingers, or using one padded with sponge rubber, will provide a more secure means of holding it. If the grip in one hand is insufficient, the other hand may be used to lock it closed (Fig. 17c). Padding the



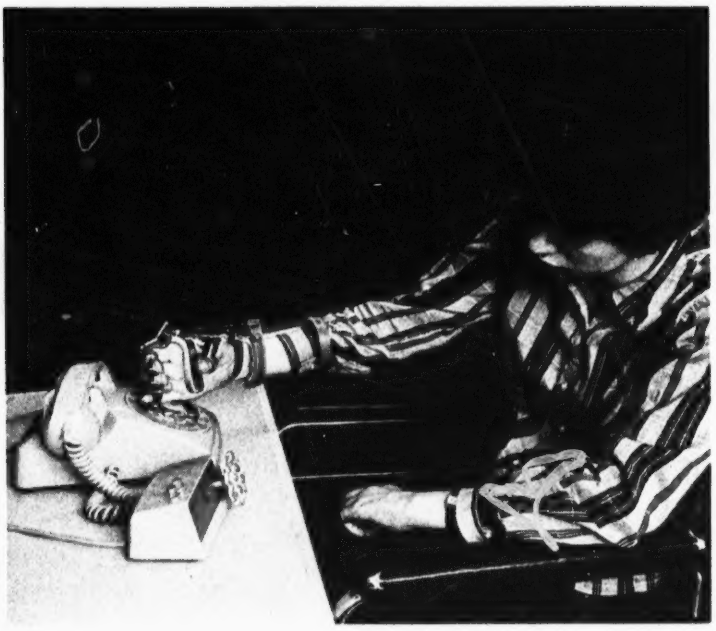
17a



17b



17c



17d

FIGURE 17

"Ball" dialing tool: Methods of holding it in the hand.

(17a) Left—"ball" dialing tool. Center—small "ball" attachment used on a pencil padded with sponge rubber. Right—"ball" dialer in universal cuff.

A tenodesis grip gives only one point of contact on the shaft of the dialer and is not sufficient to hold a "ball" dialer against the force exerted around almost all of its circumference. The following methods are useful to prevent the dialer from dislodging when the grip is not strong:

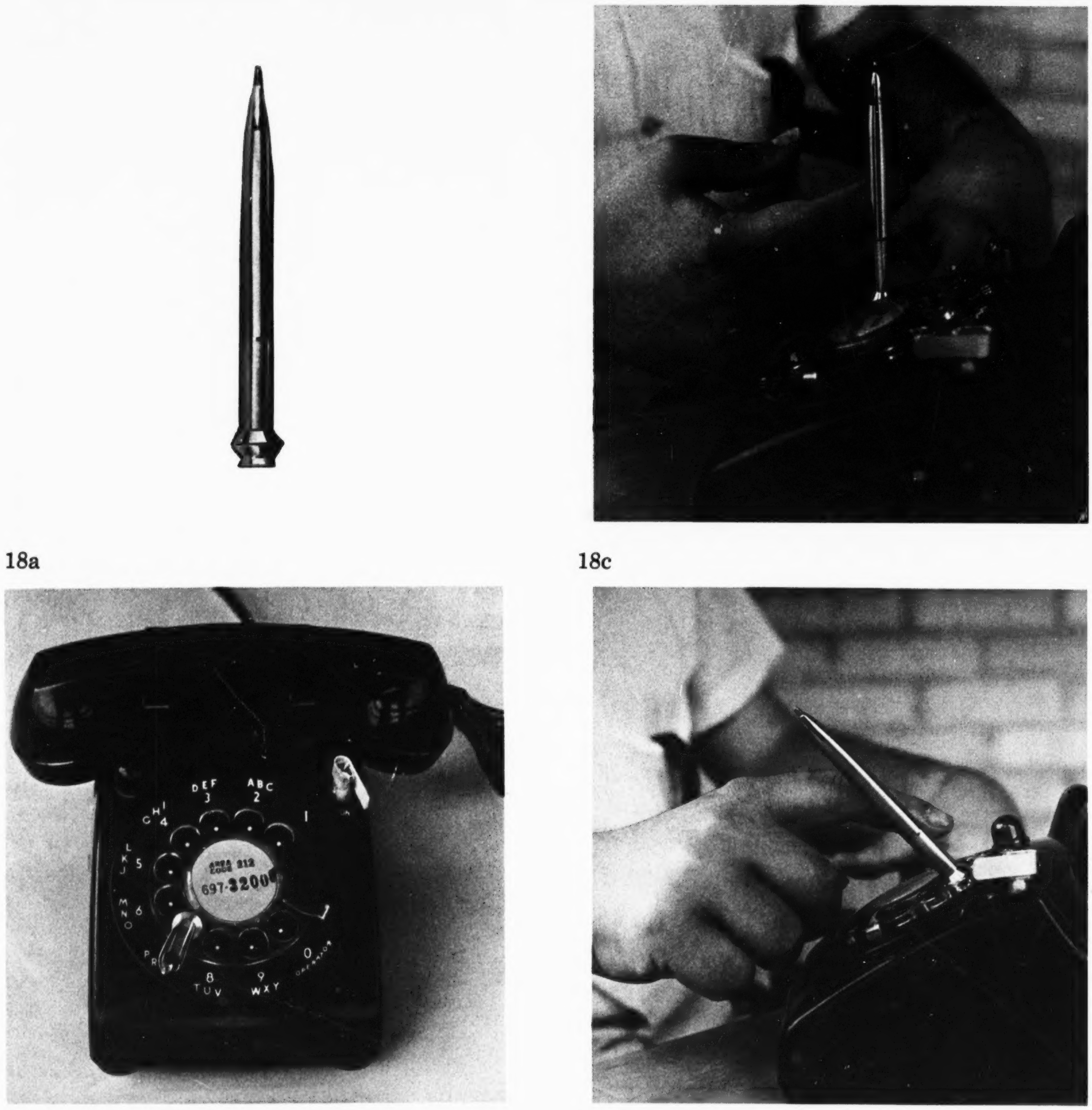
(17b) Lacing it through the fingers provides a larger area of contact. This may be sufficient to prevent the dialer from dislodging.

(17c) A large object is easier to hold than a thin one and the dialer may be padded with sponge rubber. The padded dialer may be held in one hand or, when the grip is not sufficiently strong, in both hands.

(17d) A dialing tool should only be used when necessary. Here the projecting part of a tenodesis orthosis serves the same purpose.

(b, d. Spinal Cord Quadriplegic, Group D.)

(c. Spinal Cord Quadriplegic, Group C.)



18a

18c

18b

18d

FIGURE 18

Use of a "grooved-knob" dialing tool.

The person with good movement at his wrist but who lacks strength in his shoulder and elbow to move his hand in a circle around the dial may use a "grooved-knob" dialer with a special technique.
(18a) "Grooved-knob" dialer.
(18b) The flange of the "grooved-knob" dialer permits it to rest upright in a hole of the dial finger-wheel.
(18c) The tool is used as a post. First, without moving the dial, the dialer is moved in the hole until it slants in the direction it will be pushed. Then pressure is exerted to move the dial finger-wheel.
(18d) Pressure must follow the direction in which the dial finger-wheel will move.
(Muscular Dystrophy)

dialer to provide a larger grip can also assist patients who find grasping a thin object painful.

A patient who cannot grasp a dialing tool may have it placed in the pocket of a universal cuff or into his hand orthosis. Two positions are possible: across the palm (usually toward the little-finger side of the hand) or pointing forward along the line of the fingers.

Across the Palm. This is the preferred position for a dialing tool (Fig. 19). (The fulcrum of the arm is the shoulder, therefore the nearer the dialing tool is to it, the shorter the lever arm. A dialer at the palm allows the shortest possible lever arm to the disabled person during use of his arm.) The dialing tool is used in the pocket of a universal cuff, or hand orthosis, and projects from either the thumb- or little finger-side of the hand. Although the hand may be used in a palm-up or palm-down position (where the initial position of the dial is toward 9 or 3 o'clock), its best use occurs when it is in the mid position, (the initial position of the dial will be toward 12 o'clock). This places the hand directly above the dial and allows more force from the arm to be used on the dial than when the dialer projects from the side of the hand during use in the fully pronated or supinated position.

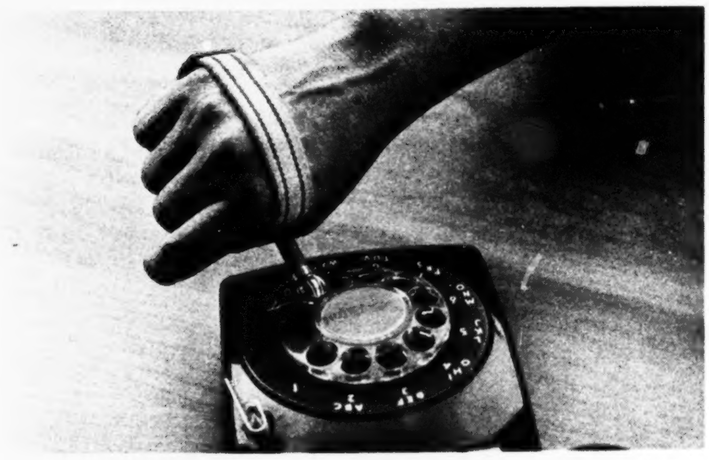
Pointing forward along the line of the fingers. This position may be the only one possible for the person whose hand is maintained in a palm-down position. When his hand orthosis contains a spring clip (Fig. 20a, b), the dialer may be inserted into it. Since this position gives a longer lever arm for the patient to move than when the dialer is at the palm of his hand, it will require a greater effort. (Initial Dial Position: toward 12 o'clock, or according to the dialer line.)

Whenever possible, a disabled person should learn to dial without the use of a dialing tool. In this way he is not dependent on it and time and effort used in the extra motions of grasping and releasing the tool may be saved. The one who uses a hand orthosis may find it has a projection that he can use in the hole of the dial finger-wheel (Fig. 17d).

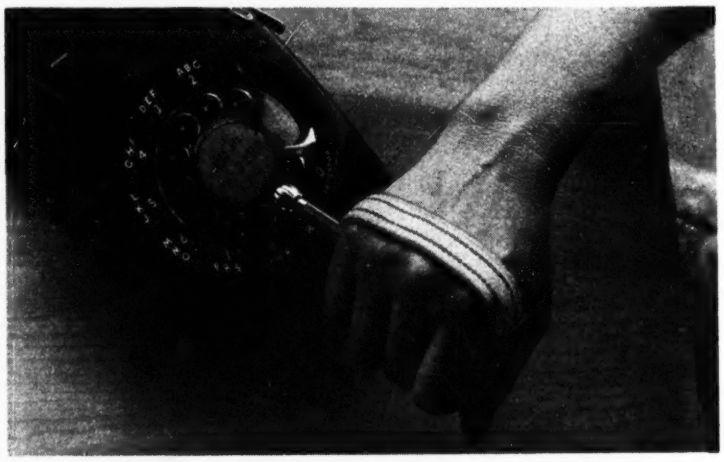
Nevertheless, when the use of a dialing tool results in saving energy through the avoidance of awkward compensatory motions, or where its use reduces pain in the fingers, it should always be advised. The disabled person who travels, and occasionally uses a dialing tool, may learn to use an instrument he is likely to have with him, such as a pencil.

A holder for a pencil and dialing tool, such as a plastic pill bottle taped to the telephone, is helpful in positioning the dialing tool upright, ready for use for those unable to pick it up easily from a position flat on the desk or table.

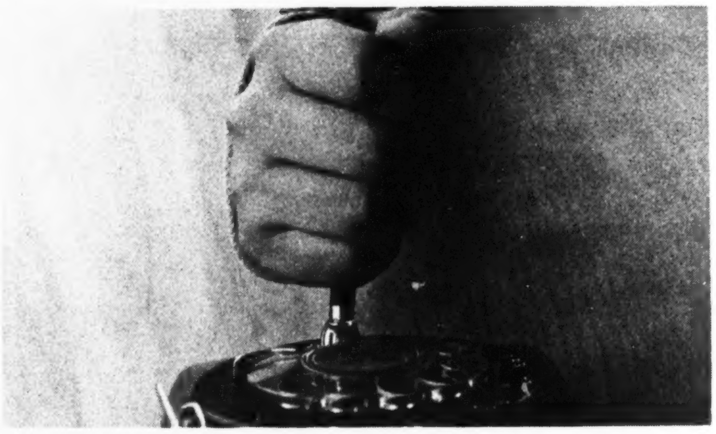
When a dialing tool has to be placed in a cuff by an assistant, careful analysis of all the circumstances in which the patient uses the telephone should be made and appropriate advice given to



19a



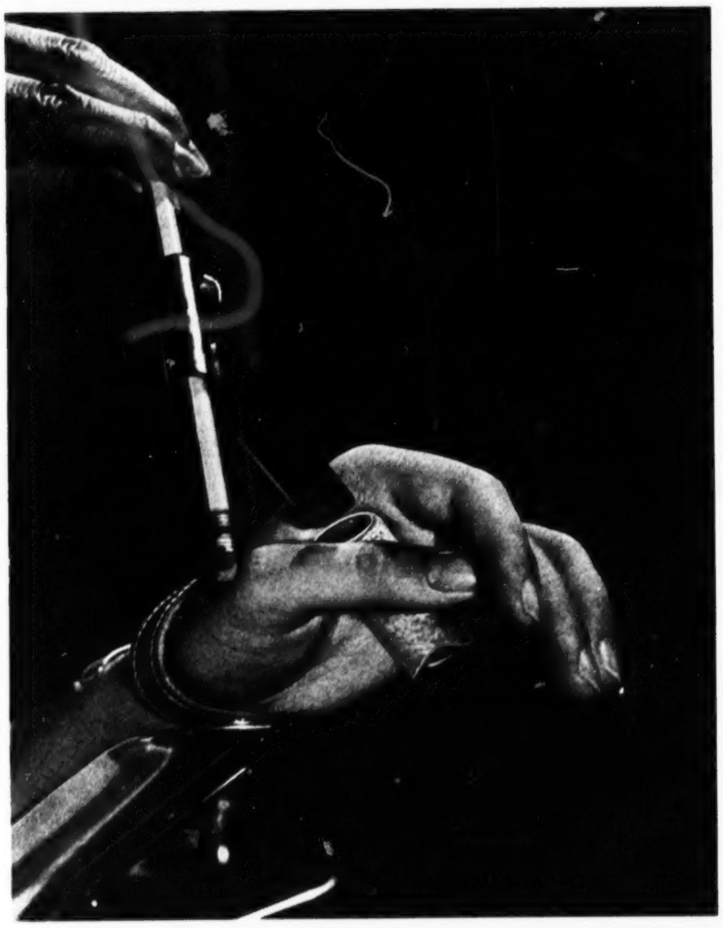
19b



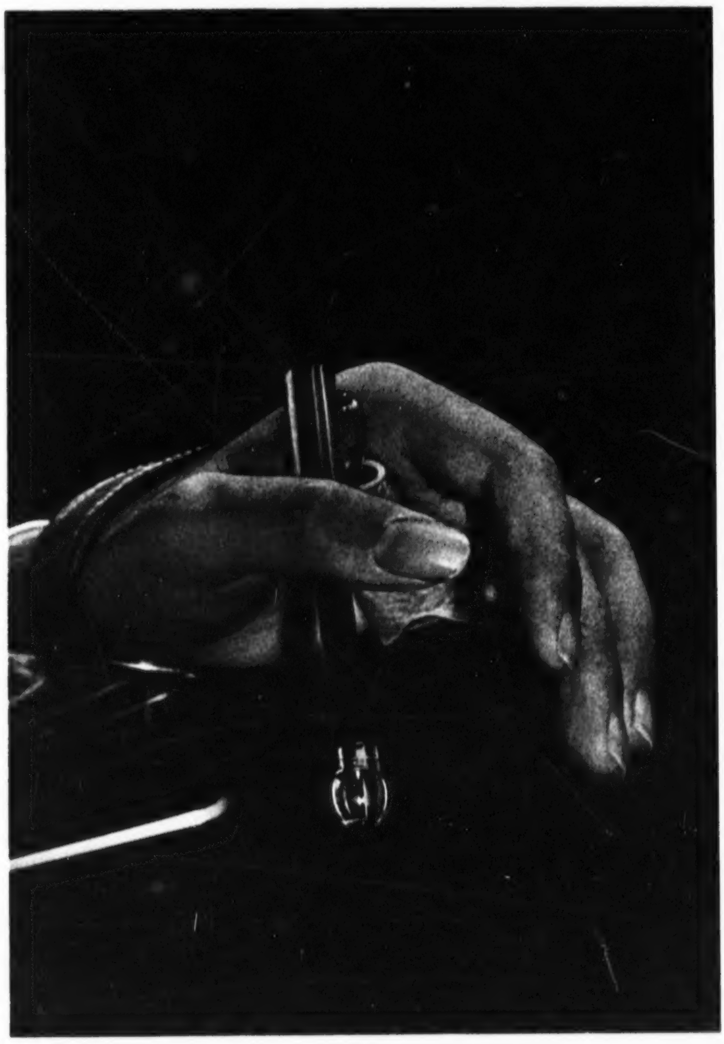
19c

FIGURE 19

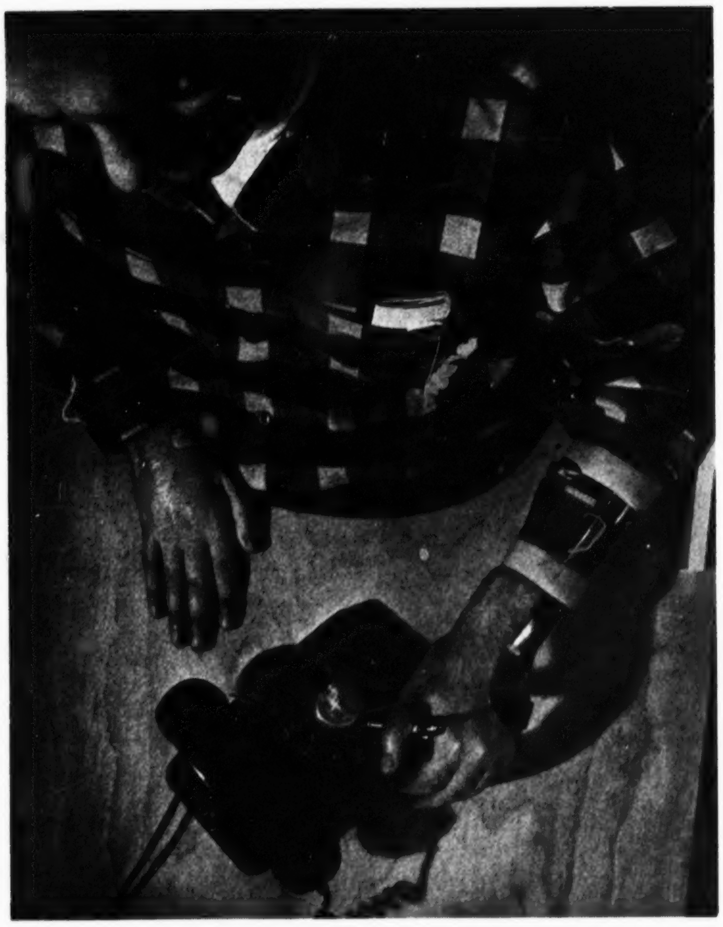
"Ball" dialing tool: in a cuff across the palm and the corresponding position of the dial.
A universal cuff is used either when the hand orthosis has no pocket or by the person without finger function but with strength in his wrist.
Examples are:
(19a, b) A hand that is maintained in the pronated or supinated position may have the "ball" dialer placed in the pocket to point out by the thumb or the little finger. In order for the dialer to contact the hole of the dial finger-wheel, the dial should be oriented initially toward 3 or 9 o'clock (approximately).
(19c) The best use of a "ball" dialer occurs when the person is able to hold his hand in the midposition. The dial will face toward 12 o'clock.



20a



20b



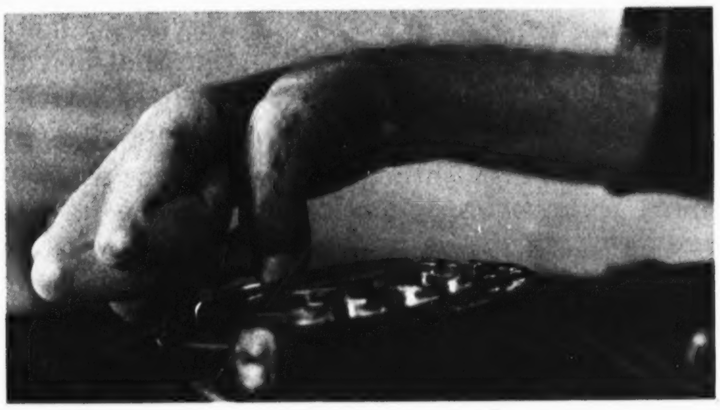
20c

FIGURE 20

Dialing tools in the spring clip of an ADL long opponens orthosis.

The severely disabled person whose orthosis can hold a spring clip may have a dialing tool inserted into it.

(20a) A spring clip—holding a pencil as a typing stick—is inserted into the pocket of the orthosis.
(20b) The spring clip may hold a "ball" dialer.
(20c) A "ball" dialer in a spring clip in use by a Spinal Cord Quadriplegic, Group B.



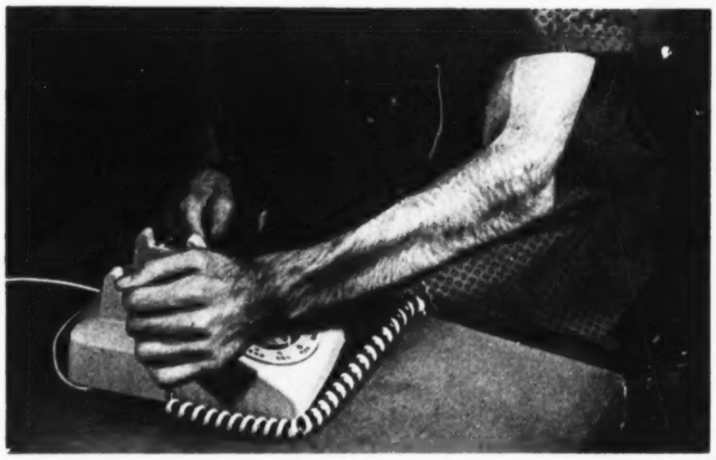
21

FIGURE 21

Using the thumb to dial.

This patient cannot extend his fingers for dialing and uses his thumb instead. As the thumb is also weak, the fingers are used to block it.

(Note the position of the dial—it faces toward the "dialer line," i.e., the thumb. See also Fig. 25.)

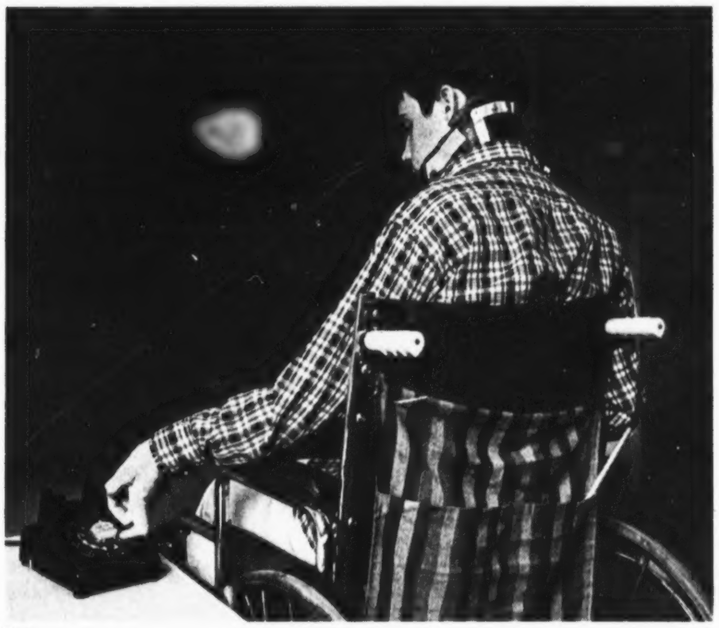


22

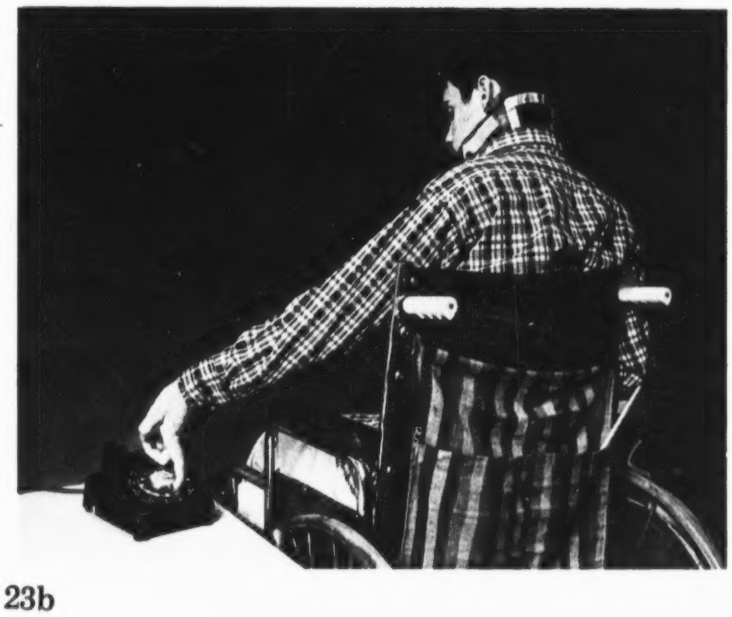
FIGURE 22

Using the palm of the hand to dial.

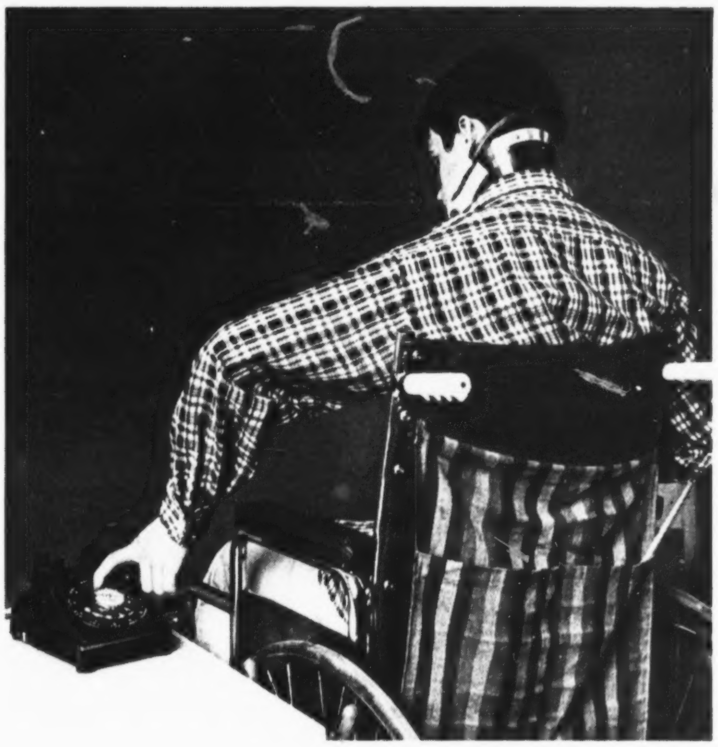
Some persons with paralyzed fingers who do not care to use a dialing tool can use the outer side of the hand to dial. This patient follows each hole visually and lifts his hand when the edge of the desired hole reaches the stop.



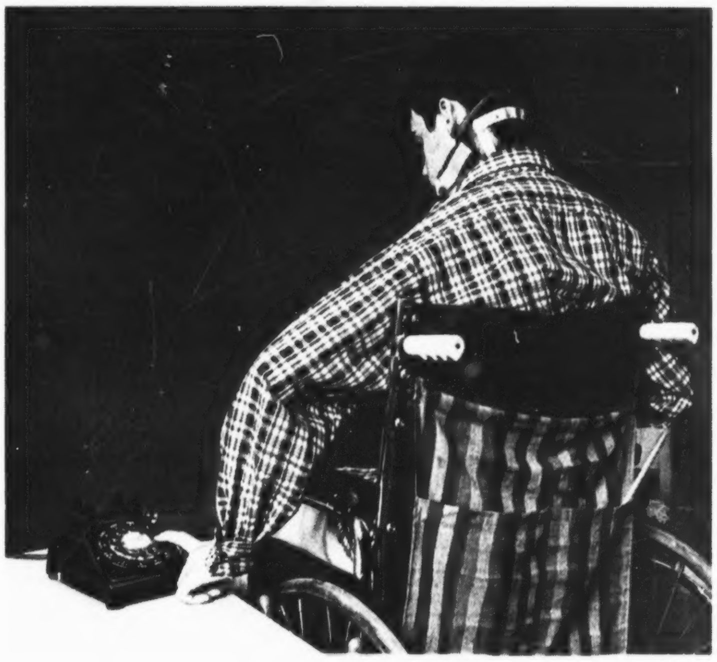
23a



23b



23c



23d

FIGURE 23

Special method of dialing when the arm has function but the fingers are paralyzed.

To prevent a paralyzed finger buckling as it is used to dial, the front or side of the finger must exert the pressure that moves the finger-wheel.
(23a) The set is placed low and to one side, and the patient places his finger in the hole.
(23b) Pressure to move the dial will be applied by the lateral and flexor aspects of his finger, so he straightens out his finger by bringing his arm forward.
(23c, d) By rotating the whole arm inward around the dial, pressure is maintained on the front of the finger.

(Spinal Cord Quadriplegic, Group D.)

ensure his maximum independence during the concurrent actions of using a handset, taking notes, etc.

By Finger or Thumb.

The person who has some movement in his finger may be able to use it to move a rotary dial (for a full analysis, see Appendix C). When his finger is not sufficiently strong, he may use his thumb or the outside of his hand (Figs. 21 and 22). In the latter method, the stop is not used to determine the number dialed. The person observes the dial holes passing under the stop and lifts his hand as the desired hole reaches it. If necessary, the numerals may be marked on the station number card as an aid in learning their positions.

Special method when the arm has function but the fingers are paralyzed. It has been seen that dialing exerts pressure around almost all of the circumference of the object used to dial. When the hands are paralyzed, a limp finger would buckle in the attempt unless a way were found to maintain its rigidity. Spinal cord quadriplegics and other patients who have good function at the shoulder, the elbow flexors and wrist extensors, can use a finger by turning the whole arm to maintain the lateral or palmar aspect of the finger against the hole as the dial is moved around to the stop. The sides and front of a finger have little freedom to move and provide enough stability so that the finger may be used as a post. A person using this technique may do best when the telephone set is low by one side (Fig. 23). Later, he should attempt using a telephone at a normal height (Fig. 24).

Strength in the pronators of a minimum level of Poor is necessary in order for this technique to be used.

While the patient able to employ this method could also use a dialing tool, he would probably have to use a cuff for attaching it to his hand. Since this would entail his slipping it on and off as needed, the use of his finger would be the more convenient method.

The Use of Parts of the Body Other Than the Hand.

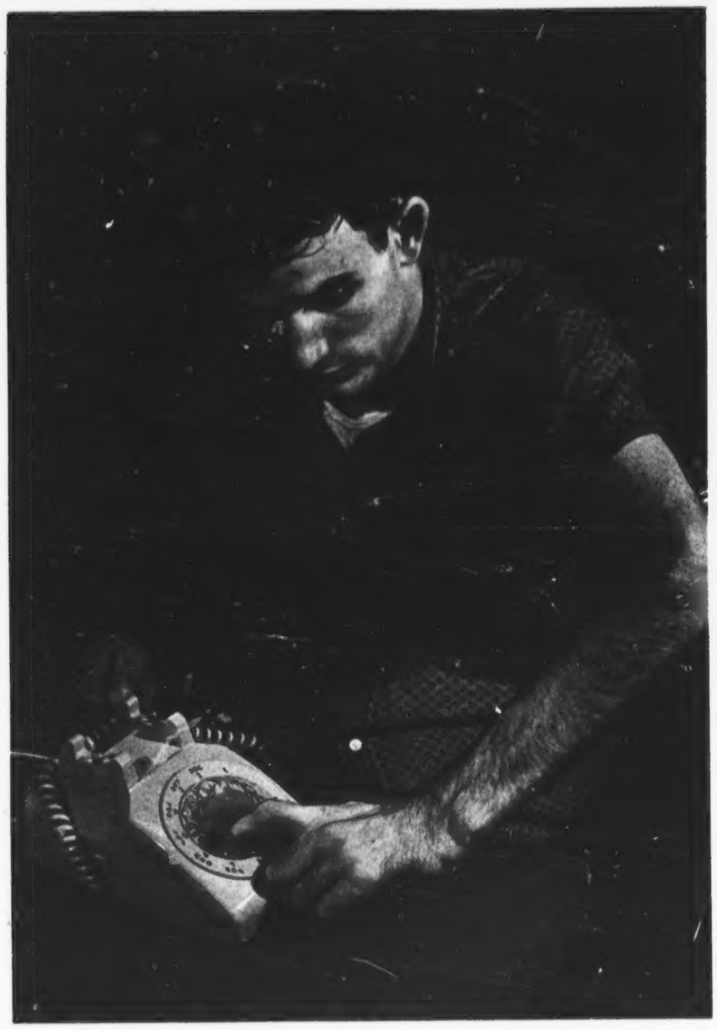
See "Touch-Tone Dial," p. 88. (Both patients were able to dial "0" for Operator on the rotary dial.)

By Mouthstick.

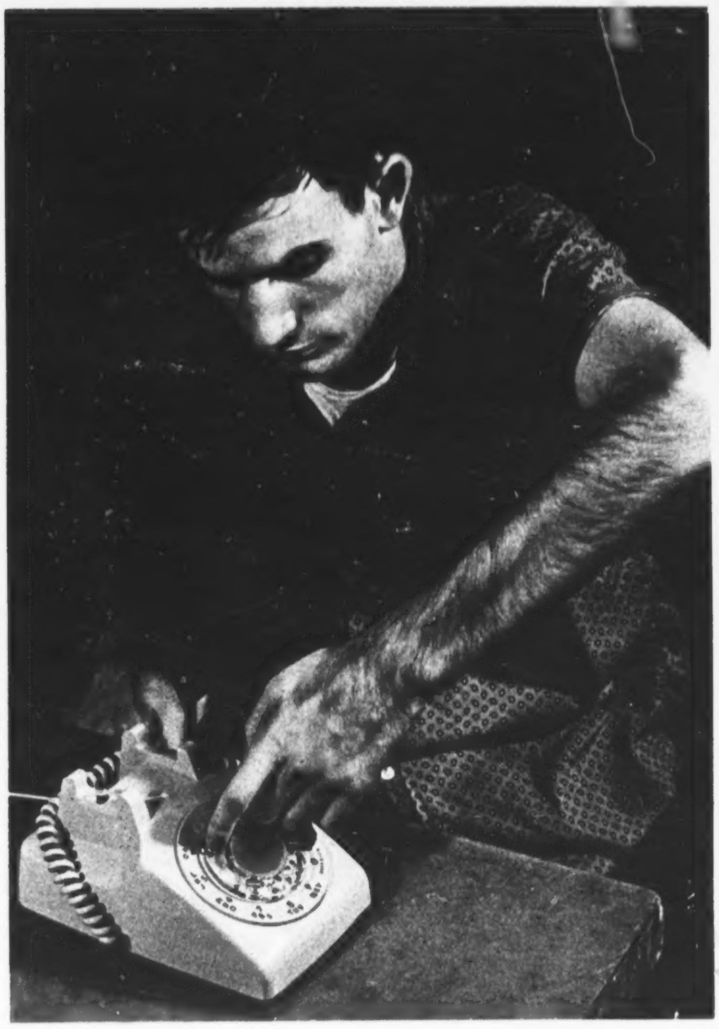
The person without arm function but with strong neck and trunk musculature will be able to dial by holding a pencil in the mouth. The long mouthstick used on a rotary dial by a person able to move only his head and neck exerts excessive force on the teeth and may damage them. Unless the dial can be positioned nearby so that the mouthstick need be no longer than 8 to 10 in., use of a mouthstick on a rotary dial is inadvisable. When a mouthstick is used, attaching the short "ball" dialer will reduce some of the force necessary by reducing friction in the finger hole.

24a

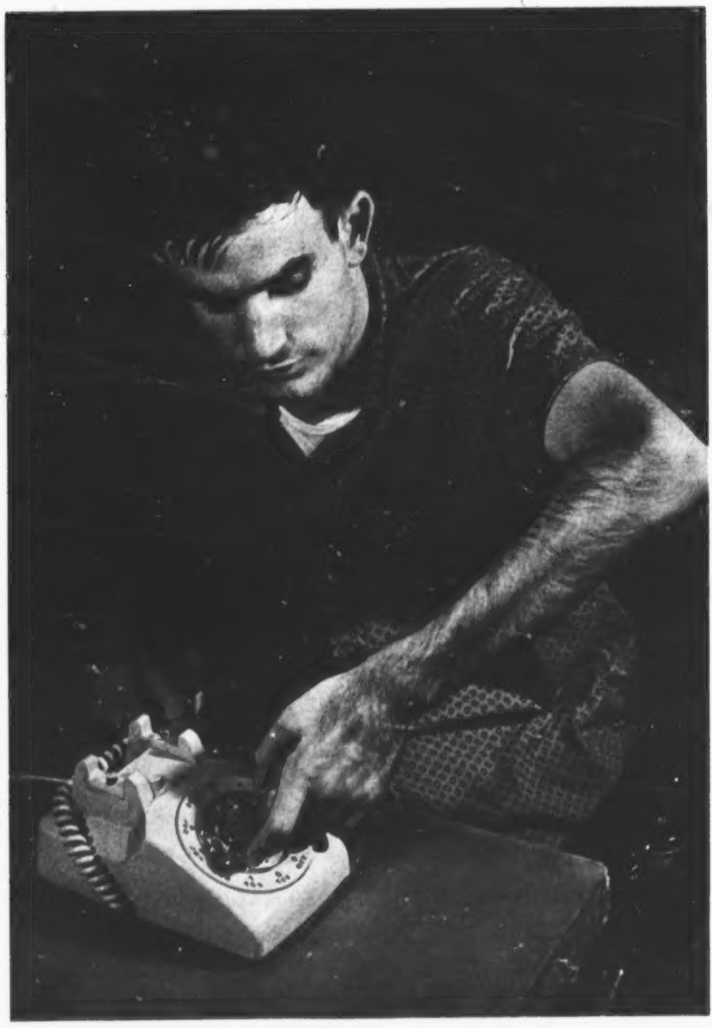
24b



24c



24e



24d

FIGURE 24

Special method of dialing when the arm has function but the fingers are paralyzed.

This patient, with a spinal cord quadriplegia (Group D), has a slightly stronger wrist than the patient in Figure 23 and he is able to use a telephone on the desk in front of him. Note the rotated position of the dial.

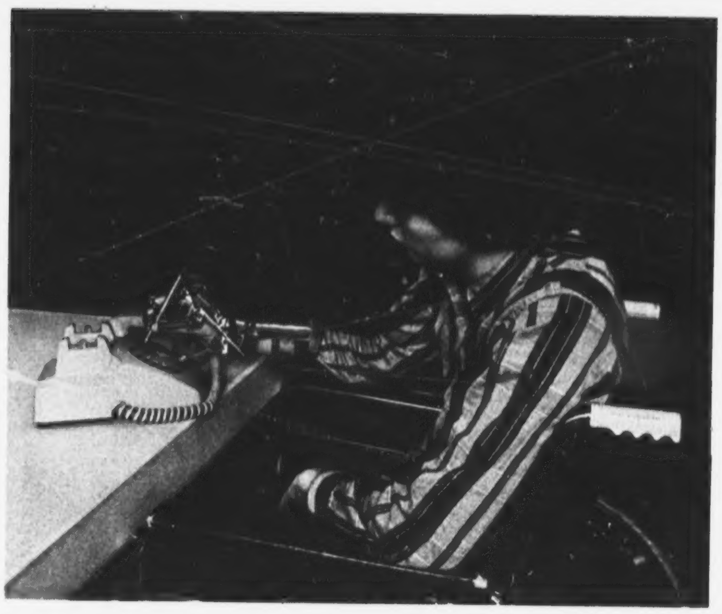
(24a) His fingers flex when his wrist is in this position, and he must move his arm forward in order to place the fingertip in the hole.

(27b) He pulls back his arm to straighten out his finger.

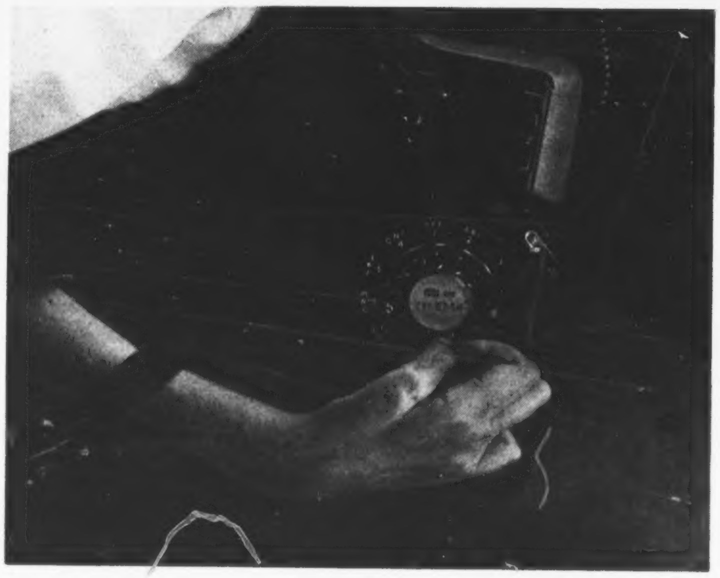
(24c) Downward pressure of his arm maintains tension on his finger and he is able to push it forward to a position by hole 7.

(24d) At this point the dial must be moved by the front of the finger, so he turns his arm quickly into external rotation to bring the finger into position.

(24e) Rotating his arm inward as he moves the dial maintains the pressure against the front of his finger.



25a



25b

FIGURE 25

Positioning a dial according to the dialer line.

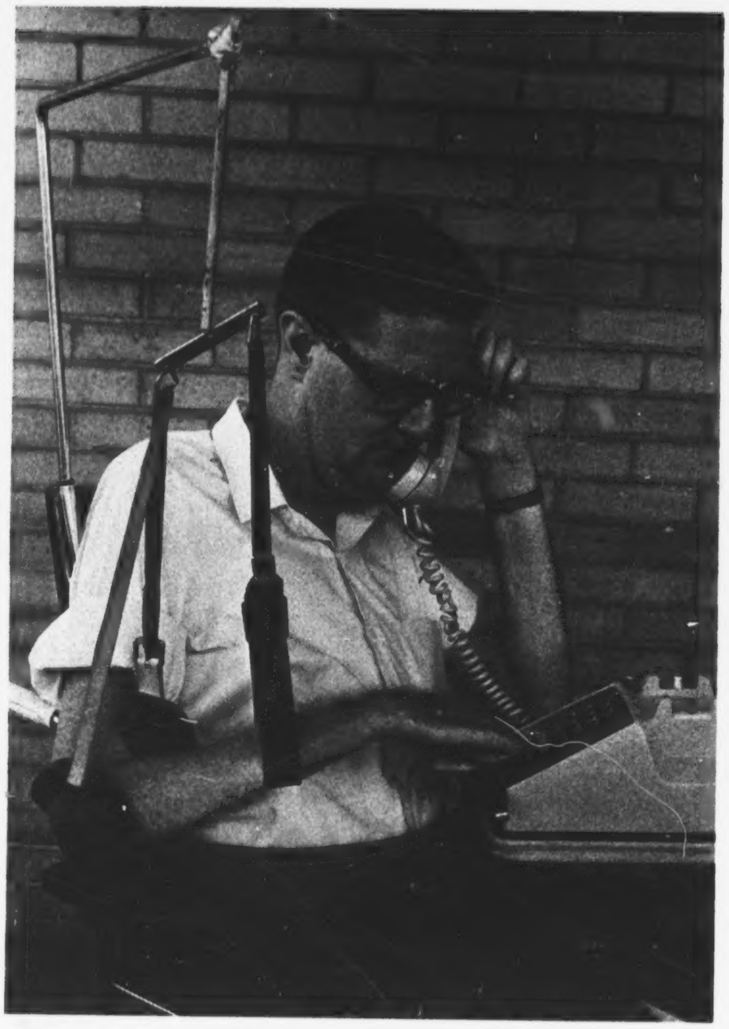
(25a) The dialer line here points downward and toward 6 o'clock. The dial therefore faces toward 12 o'clock.

(25b) The fingers and thumb of this patient are very weak but he can use his thumb when he blocks it with his fingers.

The line the thumb takes to the forearm axis (the dialer line) points to one side. In order for him to place his thumb in the dial hole, the dial must be square to the thumb. The initial orientation of the dial, therefore, is toward 9 o'clock.

(25c) The above patient uses his PIP joint on a button and the dialer line here points toward 6 o'clock. Therefore, the Touch-Tone dial faces 12 o'clock. (Note method of holding handset. He cannot grasp it but is able to hook his thumb under the receiver end to hold the handset in place.)

(a. Spinal Cord Quadriplegic, Group D.)
(b. Postpolio.)



25c

PROCEDURE FOR TESTING THE ROTARY DIAL

Most disabled people will have tried to use a rotary dial, and many will have succeeded. For these people it will only be necessary to ensure that they can use the dial on the kind of telephone deemed suitable up to this point in the evaluation. Others may have failed in earlier attempts because they were unaware of the possibility of using a dialing tool, because the dial used was a more resistive type, or because they were unaware of the importance of the dial's position in allowing them to exert force most effectively. Given the opportunity to dial under optimum conditions, these people may develop sufficient skill to use a rotary dial.

The person unable to use a finger or thumb but who has sufficient power in his arm to move the dial should test the dialing tools. If necessary, they may be attached to his hand by a universal cuff.

The person who will want to use a telephone with a headset jack has the choice of desk telephone or 4A key equipment. The decision as to which is more appropriate will be influenced by his performance on a dial; in some cases the 1008B separately housed dial is more satisfactory than one mounted in a desk telephone because of its lower height and flatter inclination.

The most difficult number to dial is "0", because it requires the greatest number of changes in the direction of movement. However, some persons who can dial this may find the 7 or 8 equally difficult since they cannot use the momentum from segment 0–7 to get "uphill." In addition, the effort of dialing seven digits of a telephone number may be excessive. In both these cases, the disabled person should be advised to dial "0" and to ask the operator to place the call. If the operator tells him that the number may be dialed, he should identify himself as a disabled person and ask for her assistance.

Before concluding that the disabled person is unable to use a rotary dial, it is most important to allow him intervals of rest and adequate time to use it. The testing procedure is tiring, and sometimes the patient may be too fatigued to succeed at that time. After a day's rest he will do better.

It is assumed the person who stands while dialing has opportunity to change his own or the dial's position; discussion of distance, height, inclination, and rotation of the dial relates to its use from a sitting position.

Positioning the Rotary Dial

Testing is begun with the 9-type dial of a desk telephone and transferred to the 1008B separately housed dial if it seems the flatter inclination would provide an advantage.

The direction in which the patient's finger, thumb, or dialing tool points from the forearm axis (the dialer line) determines the initial placement of the set, see Fig. 14, p. 92. (Further alterations of the rotation of the set containing the dial in response to the patient's arm movements are described later under "Adjustments in Rotation.")

Dialer line pointing downward (but toward 6 o'clock).

The set is placed square to the forearm axis (toward 12 o'clock) (Fig. 25.)

Dialer line pointing to either side.

When the disabled person is unable to point the tip of his finger, thumb, or dialing tool (dialing tip) downward, and it projects to either side of the forearm axis, in order for the dialing tip to be placed in the finger hole, the set must be rotated so that the dial face is perpendicular to the dialer line. This may result in the plane of the dial finger-wheel being placed parallel to the forearm axis and the dial facing toward 3 or 9 o'clock (Fig. 25.)

Distance.

The set should be placed close enough to the person's arm for him to place the dialing tip in the hole of the dial finger-wheel without effort. He will probably ask that the dial be moved toward him or away as necessary, but when an objective test is needed to determine the correct distance for the person who has only partial function at shoulder and elbow, he can be asked to swing his forearm gently in horizontal sweeps; the center of the arc made by the dialing tip will indicate the position for the "0" of the dial and the placement of the set. (Frequently the dial will be opposite the shoulder.) (Fig. 26.)

Inclination and Height.

Adjusting the height of the dial, in effect, alters its inclination relative to the user's arm (see Fig. 12, p. 89). Height and inclination cannot be isolated from each other and should be considered together.

When the *inclination* of the dial in a desk set or in the separately housed dial seems unsuitable during testing, the correct angle may be gained by propping it up. If a dial inclining away from the user is needed, the set may be turned completely around; the numerals will still be visible to him, (see Fig. 16, p. 94).

The *height* of the table on which the dial is placed should be as low as is consistent with allowing the wheelchair to approach under it. If the disabled person has a lapboard, the set may be placed on it. When a balanced forearm orthosis is used, there may be an advantage to having the height of the dial even lower than these positions (see Fig. 12, p. 89).

When the special technique for dialing with a paralyzed finger is used (p. 100), it may be easier for the patient to operate the dial when the telephone is placed at the side of his chair and low enough to be comfortably reached by his extended arm.

The person who uses a dialing tool, particularly if he holds it in a hand orthosis or a cuff, may not be able to alter the angle at which it projects from his hand because the position it takes has resulted from his finding the most secure anchorage. When the angle between the dialer and the dial creates a poor mechanical advantage for the patient, the dial must be moved up or down. A sighting taken from the side at the level of the set while he is using it can indicate whether it should be raised or lowered, and also, whether or not the inclination is correct for the patient's direction of movement. (see Fig. 13, p. 91).

Wallphone.

The height at which a rotary-dial wall telephone should be installed is determined by the method the patient can use to dial. When a dialing tool is employed there may be only one angle at which it will protrude from the hand. As the set is lowered or raised the angle between the dial and the dialing tool will change as the patient moves his arm in following it. The position selected for installation should correspond to that place at which the patient can dial most efficiently. When the dial is too low, the fingers may strike the handset hanger and it may be necessary to raise the set as high as is convenient for the patient to take off the handset. Unless the patient's shoulder function indicates otherwise, the initial testing position should be with the bottom of the dial opposite the top of his shoulder.

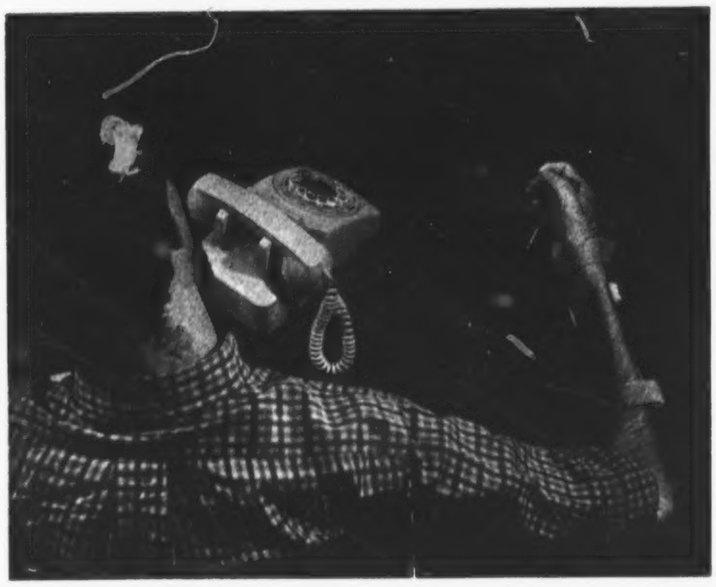
When a wall telephone is not available for testing, the evaluator can simulate one. The handset can be rested on two of the evaluators fingers, projecting forward to simulate the handset hanger, and the patient should be asked to attempt to remove the handset. Following this test, a separately housed dial may be held against a wall, wedged out to approximate the vertical inclination of a dial on a wall telephone.

Adjustments in Rotation.

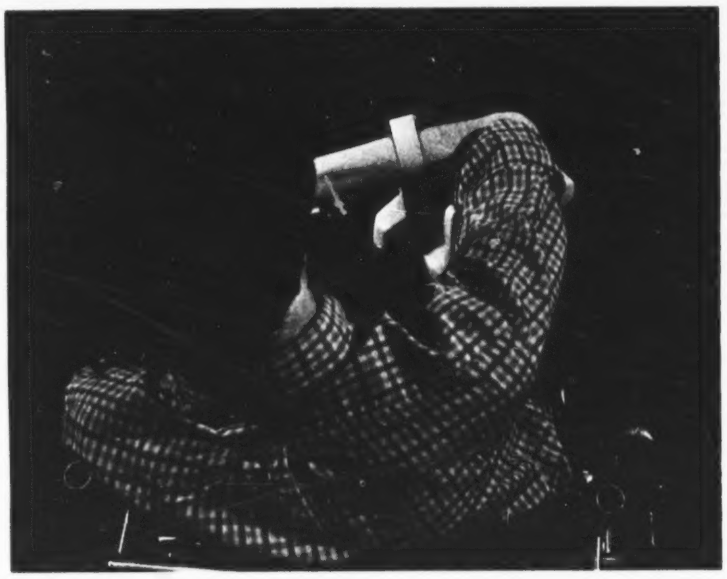
It has been stated that the purpose of adjusting the rotation of the dial is to assure that the plane of the arc of its movement corresponds to the one made by the dialing tip as it is moved by the disabled person's arm. Accurate observation of the segments of the dial at which the patient has difficulty are necessary, and the delicate adjustments are made by trial and error.

After the dial has been placed in its initial position and the disabled person is unable to dial—after some repositioning and one or two attempts—he should be instructed to place the dialing tip in hole 2 and move the dial to the stop, and to repeat for hole 4. If he is unable to reach as far as the stop, the set is rotated counterclockwise around the axis of the dial (see Fig. 15, p. 93) until the stop is opposite the point he was able previously to reach. (Fig. 27). He then progresses through holes 6, 7, 8, 9, and 0.

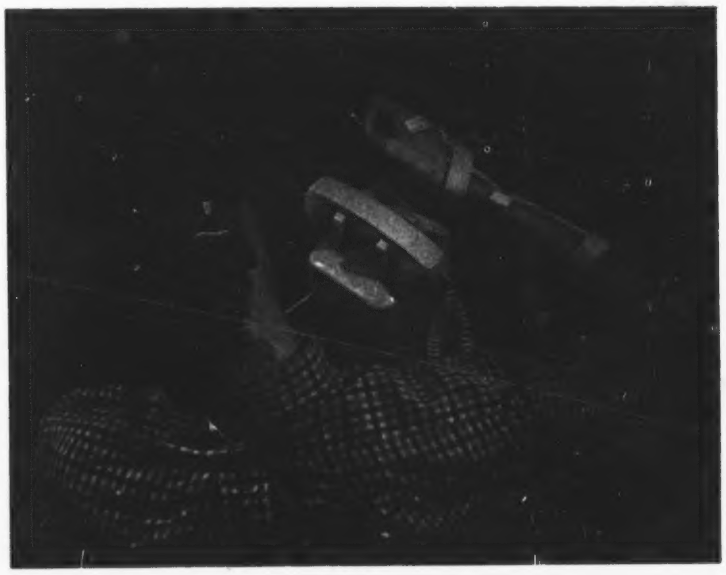
If the counterclockwise motion has brought the *side* of the dial with segment 7–3 too close to the dialing tip (as shown by the uphill movement ap-



26a



26b



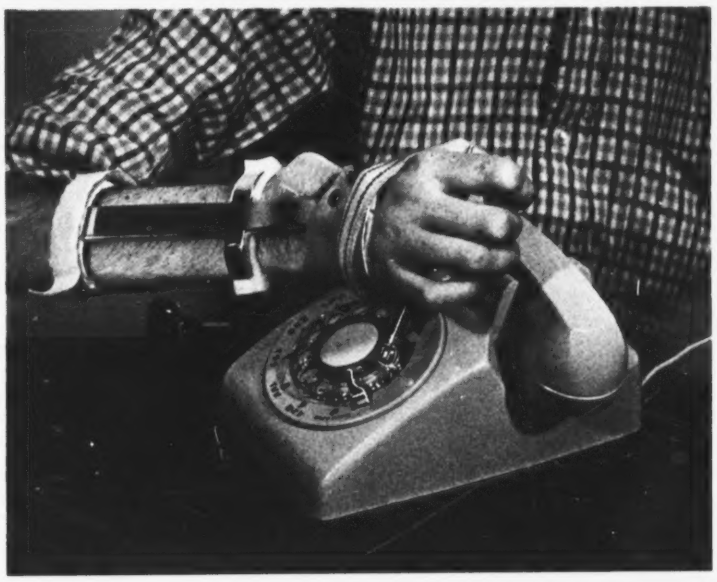
26c

FIGURE 26

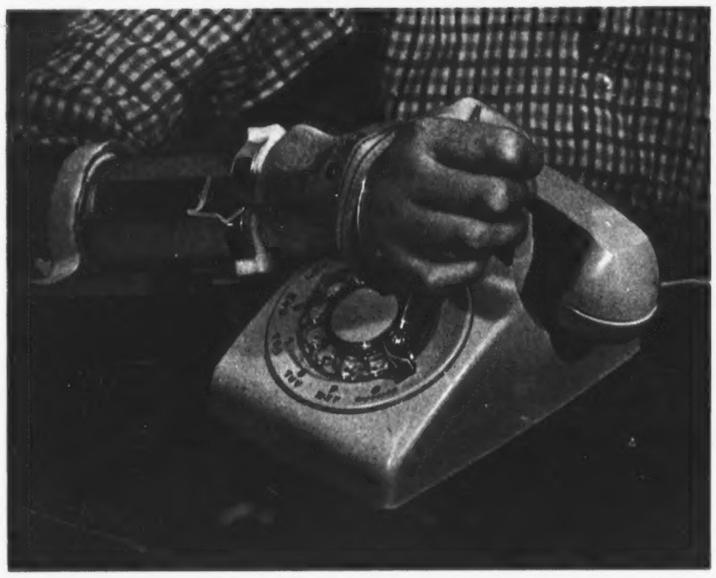
Positioning the rotary dial for distance.

This patient cannot extend his elbow to reach toward the dial and he has difficulty in moving the dial finger-wheel "uphill" in segment 7–3. He will move the finger-wheel by flexion of his elbow, and the set has been turned around to allow this. It is important that the dial is in the optimum position for distance, and when the patient is unable to determine this, the following method is used:
(26a, b) The patient moves his arm gently in controlled horizontal sweeps.
(26c) The center of the arc made by the "ball" dialer is the position in which to place "0." (The center of the dial will frequently be opposite the shoulder.)

(Note: This patient with a Spinal Cord Quadriplegia, Group B, would not be able to use the standard handset; he would use "hands-free" equipment for conversation.)



27a



27b

FIGURE 27

Adjustment in rotation of the dial.

A dial is placed approximately in position and the set is adjusted as the patient uses it. Here, the set has been turned around to allow easier movement through the "uphill" segment 7–3.
(27a) The patient is unable to move the dial finger-wheel as far as the stop.
(27b) The set is rotated around an axis through the center of the dial until the stop has been brought to the place the patient can reach.

(Spinal Cord Quadriplegic, Group B.)

pearing to be obstructed) the left side of the set is moved slightly away, using the *stop* as axis. This movement, however, may lessen the momentum to be gained from segment 0–7 by shortening its distance relative to the dialing tip.

If it seems a greater momentum from segment 0–7 would be helpful, then the dial should be moved counterclockwise around the axis of its *center*. If the effort of moving up through segment 7–3 is still too great, the dial may be turned around entirely.

It has been noted that dialing is a skill. Once the person has succeeded in moving the dial two or three times completely from 0 to the stop, he should rest his arm one or two minutes. When he attempts dialing again, it will be found his timing will have improved and dialing will be smoother and easier. If he tries dialing when thoroughly rested on the following day, he may show little evidence of the effort necessary for the earlier attempts. Eventually his skill will develop so that accurate positioning of the dial will no longer be important and a dial that has been reversed may be used facing forward.

Sometimes the position that is best for use of the dial will make it impossible for the disabled person to grasp the handset. When a position cannot be found that will allow use of both dial and handset, a telephone with a switch (for example, a two-line telephone with lever modification) will allow the disabled person to leave the handset in a convenient position off the cradle.

PROCEDURE FOR TESTING THE CARD DIALER

Neuromuscular Incoordination, Difficulty in the Recognition of Numbers, Identification of Cards, Perceptual Deficit.

Neuromuscular Incoordination

When the loss of control is very severe, a Card Dialer will not be helpful, but this cannot be known until the patient has tried to use it. The features of the equipment may be tested in the order given below. Failure at the early levels indicates that the test should be terminated.

During the test, if the patient is not accurate in following instructions and does not realize when he makes mistakes, the instructions for "Perceptual Deficit," to follow, should be consulted. If it appears desirable to check his ability to recognize names, consult "Identification of Cards," to follow.

1) The evaluator should demonstrate the normal use of a Card Dialer (p. 41) to the patient and describe the method of using a card for "operator" without removing it from the slot (see 5).

2) *Depression of a card:* The evaluator rests the card in the slot and asks the patient to depress it completely.

The initial pressure of almost 2 pounds on the top of a card that is necessary to start it moving down the slot is greater than the bending resistance of the plastic card, and a steady pressure can cause it to buckle. The person who is unable to grasp the card by its side, and who needs instead to push on its top, may avoid the card buckling by "slapping" it with his hand. After the card is down a short distance, a steady pressure may be applied. The patient must be able to depress the card completely.

3) *"Start" bar:* The patient should be able to depress the "start" bar completely.

4) *Handset or "Hands-free" Equipment:* The patient must be able to take the handset from its position on the side, or to operate a switch if he plans to use a handset-holding device or headset. The telephones for these will be the 6-button Card Dialer or the Card Dialer with headset jack. Accordingly, test these controls now. If the Card Dialer requires repositioning during the tests that follow, afterward recheck the patient's ability to reach the handset, "start" bar, and switch.

5) Success in these preceding steps is all that is necessary for use of a Card Dialer when the patient is capable of telling the operator which number he needs: A card punched for "operator" is left ready in the slot for him to depress. Using the "start" bar will dial the operator and the card will have risen and be ready for the next call.

(In time, wear on the card will necessitate its replacement and the person who places many calls should have another card prepared.)

It should be noted that when Touch-Tone calling is available, the use of a Card Dialer for the above purpose is unnecessary.

6) The Card Dialer may be equipped with a card guide (special assembly), see p. 41. This will assist entry of the card for the person who has difficulty in aligning it with the slot. If a card guide is part of the set the evaluator is using to test the patient, the evaluator should judge by the patient's performance in test 7 whether a card guide will be necessary in the event that the patient chooses to have a Card Dialer.

7) *Placing the card in the slot:* The evaluator hands a card to the patient and asks him to place it in the slot. Note whether the patient can identify the correct way of inserting the card. If he places the wrong end down, tell him that it is upside down and observe whether he understands. If he does not, bear this in mind and consult "Perceptual Deficit", test 8. Meanwhile, take the card, turn it and return it to him.

When the patient cannot hold the card in alignment with the slot, and cannot alter the position of his arm, the Card Dialer itself may need to be turned to bring the slot in alignment with the card.

When the patient has difficulty inserting the card, he may gain control by resting his elbow on the table. In this case, the Card Dialer may need repositioning in order to allow space for this method of gaining control over his hand and to align the slot with the card.

When the patient can insert the card, use test 8. When he has difficulty, the patient should rest his arm for a short while. Allow him a few more attempts to succeed, or should he become discouraged before this, ask whether he thinks he would be able to use a card with practice. Proceed as indicated, either allowing him more time, or stopping the test.

8) *Grasping the card:* The storage bins at the rear of the Card Dialer do not provide easy access to the person without good hand function. The patient may attempt to select a card from the middle of the index, but if he does not succeed, other places for storage should be considered and discussed with him. Reaching out to the storage bins may worsen his control and he may prefer to hold the cards in a pack in his hand in order to select one. Placing a separate box on the table from which he may take the pack may be a helpful solution.

If the patient cannot use names as labels for cards, see "Identification of Cards."

Difficulty in the Recognition of Numbers

When the patient's difficulties in using an ordinary dial are due to impaired vision, mild confusion or the simple losses of cognitive function due to aging, the evaluator should demonstrate the steps of using the Card Dialer, ask him to repeat them, and discuss with him whether this type of equipment will be helpful. The cards used should be clearly and boldly marked, and the patient should try to select the appropriate one. (The test below may be used as a guide, if desired.)

When the inability to recognize numbers is due to an aphasia, the evaluator should not rely on a verbal reply from the patient, but should demonstrate and observe the patient's performance. If the patient is hemiplegic, the evaluator should use the appropriate hand during his demonstration.

1) Remove all cards from the storage bin except one.

2) Demonstrate in definite sequence: grasping the card, placing it in the slot and depressing it, lifting the handset to the ear for dial tone, pressing the "start" bar. Pause; state this will be repeated and replace the handset and card.

3) Pause. Repeat sequence, and invite the patient to perform it. If he hesitates, prompt each step by pointing to the next object in the sequence. Allow the patient to perform the sequence two or three times. If he cannot perform it after several attempts or cannot find the slot, proceed to "Perceptual Deficit."

4) Place the index cards back in the storage bin, including three or four marked cards appropriately filed.

5) Ask the patient whether he can find the one marked, for example, "JOHN."

6) When the patient looks behind the correct index card and finds it, it may be assumed he can use a Card Dialer.

7) When he has difficulty, remove the index cards, leaving the marked cards, and ask him again to find "JOHN."

8) Then, if necessary, take the cards out and spread them on the table. If the patient still cannot pick out "JOHN," proceed to "Identification of Cards."

Identification of Cards

When the patient has been unable to find the card marked "JOHN," several factors may be involved.

1) The name "John" is unfamiliar to the patient and using a name of a friend or relative will have more meaning. Either ask him for the name of a person he would want to speak to over the telephone or ask the family for such a name. Write this name clearly on a card, shuffle it with the others, spread on the table and ask him to pick it out.

2) The patient cannot translate the spoken word "John" into the written word "John." Mark another card with "John," shuffle it with the four or five others and spread them on the table. Tell him that two cards are the same and ask him if he can pick them out. Success indicates he probably could use a photograph for identification. (But using a photograph or other method of identification should still be considered even when he is not successful.)

3) Any written word may be meaningless to the patient. A photograph might be used for identification. (See p. 43.) If possible, discuss this. If necessary, enlist the assistance of the family to find a photograph, then test his ability to recognize it.

4) The use of symbols in place of words or the use of a code is unlikely to be of assistance, but in a few cases they may be helpful. This should be discussed with the patient, if feasible.

5) Whenever possible, after a method of identifying the cards has been found, the patient should be rechecked using the entire sequence of the Card Dialer.

6) If the patient decides to have the Card Dialer and there is any question that he might forget how to operate it after it is installed, the family should be instructed in its use. They can then help him to practice until he becomes competent in its use.

NOTE: In cases where the Card Dialer is employed to allow the family to leave the patient alone in the house, the patient may not be required to identify a card. His family will leave the appropriate one ready for him.

Perceptual Deficit

The person with a perceptual deficit may not necessarily have a significant loss of muscle strength or coordination; the deficit will show itself when he attempts to perform an activity. He may appear unsure of "how" to do it or become confused about the sequence to follow. He may or may not recognize numbers or names.

Some problems this person may face are in being able to distinguish an object against its background or in appreciating space relationships. In using the Card Dialer, this may lead to difficulty in locating the slot and in judging the alignment of the card necessary for inserting it.

Since the patient may have difficulty in learning the sequence of actions, the evaluator checks his ability to use a card first and only later introduces the use of the handset.

1) Remove all cards but one from the storage bin and take the handset off the switchhook. (It will remain at rest on the table until test 10.)

2) The edges of the slot of the Card Dialer should be a distinctive color to stand out from the background, and/or

3) The card guide may be employed to assist entry of the card.

4) The evaluator should demonstrate the steps of taking out the card from the storage bin, placing it in the slot, depressing it, and pressing the button. Replace card.

5) The patient should not rely solely on vision to locate the slot. The sensation of touch will provide an additional cue so, next, the patient should be encouraged to feel the slot with his fingers.

6) The patient should take the card from the bin, insert it and depress the "start" bar.

7) Allow the patient time to perform this. If he has not accomplished it after a short while, ask the patient for the card (replace it in the bin) and repeat 5 and 6. Abandon the test when several attempts fail. However, discuss this with the patient to see if he thinks he might be able to use it another day. Also, describe how a card for operator may be left in the slot and ask him whether he would be able to ask the operator for a number. If he states that he could, check his ability to find a name and number in a clear and well spaced list (NOT a telephone directory). Ask him to repeat the number. (The person able to ask for a number will not need a Card Dialer if Touch-Tone calling is available.)

8) The patient who can insert the card should be tested for his ability to perceive the top and base of the card. He should be given a labeled card to examine and shown the difference between the smooth area of the top and the holes in its base. He should rub his fingers over it to feel them. Then

his ability to recognize and place the card correctly in the slot may be checked by handing him the card upside down, asking him to "look at it and feel it very carefully" and then insert it in the slot.

The result of this test indicates whether the patient should learn always to place the card in the slot immediately after picking it out of the storage bin. This technique may not be important when he can recognize the difference, but when he cannot, he must be careful to avoid dropping the card or leaving it flat on the table.

9) The method of identifying the cards should be discussed when the patient cannot use names.

10) Having established that the patient can use the card, introduce the use of the handset. If the patient has the use of only one hand or has had difficulties with selecting a card, instruct him to pick up the handset between depressing the card and using the "start" bar. This will assure his concentration on the first action—the most important one—of using the correct card.

Amputation of the Arm

Types of Prostheses and the Suitability of Telephone Equipment

	Unilateral and Bilateral Below Elbow (B/E)		Unilateral Above Elbow (A/E)		Above Elbow and Below Elbow	Bilateral Above Elbow	Unilateral Shoulder Disarticulation (S/D)
	Refer to "The One-Handed" (p. 113) if desired						Refer to "The One-Handed" (p. 113) if desired.
Terminal Device	*Hook*	*APRL Hand*	*Hook*	*APRL Hand*			
Standard Handset (must be G3—for its shape and weight)	Good. Elbow flexion must be full, i.e. 135°, to allow the handset to reach the ear.		An elbow turntable is essential to allow the terminal device to be placed by the ear. An elbow flexion assist is necessary to raise a standard handset to the ear. If not present, the handset may be placed in the terminal device after the elbow has been fully flexed. (See Fig. 28 for methods of holding).		The below-elbow prosthesis will be used for telephoning, except for holding the handset while writing, etc. The prosthesis used for this will depend upon which arm is used for writing. "Hands-free" equipment will be helpful.	Preferable to use "Hands-free" equipment	It is unlikely that this person will use his prosthesis for telephoning. "Hands-free" equipment must be used unless the shoulder has a universal joint and a wrist flexion unit.
Wear-it-or-Hold-it Handset	Its light weight may be helpful. Test.	May not be suitable but test if desired.	May be helpful. Test.	Not suitable. (Fig. 28)			
Shoulder rest	Useful when it will stay in position.		Good (Fig. 28)			No. It cannot be placed in position.	No, unless used on the normal side.
Speakerphone	Enlarged tops to buttons, volume-control wheel.		As for B/E, consider paddle-lever device.			Excellent; as for unilateral A/E	
Extension or Gooseneck Arm	Good	Good	Good	Good		Good	Good
Lightweight Headset on eyeglass frames	Good	Good	Good	Good			Good
Line button	The metal tip of a hook may slip off the plastic button. The rubber lining of the closed hook forms a shallow slot: This may be used on the edge of a square button to depress it.	Good	This may be pressed by the normal hand.			Possibly; test if desired (A switch separate from a telephone set should be considered in order to minimize the distance to be reached.)	
Levers	Excellent	Good	Good	Good		Possibly	
Rotary Dial (must be 9-type for its flat surface)	Good, by hook tip	By dialing tool; to prevent wear on glove	Good, by hook tip	By dialing tool		Hook—by tip Hand—by dialing tool	Dialing will be done by the normal hand.
Touch-Tone Dial	Excellent	Excellent	Excellent	Excellent		Excellent	

7.
Selected Diagnoses and Disabilities

Because no one person is affected in exactly the same manner as another with the same diagnosis, the selection of a telephone can only be made after an evaluation of the individual's physical ability to operate one. No definitive statements can be made about the telephone equipment found useful for patients in some diagnostic categories, such as the degenerative nervous system diseases. However, there are some conditions about which assumptions can be made. For example, in muscular dystrophy—where a loss of shoulder and elbow function occurs prior to involvement of the hand—it can be stated that there will be difficulty in using a standard handset and that a "grooved-knob" dialing tool will be useful. Similarly, in spinal cord quadriplegia it is possible to indicate the equipment found useful for patients at each level of residual function.

The following section provides information about those diagnoses and disabilities where such patterns of involvement are evident and where it has been possible to recommend the use of specific items of equipment. It is intended as a guide and should not be regarded as a substitute for an evaluation of the patient.

AMPUTATION OF THE UPPER EXTREMITY

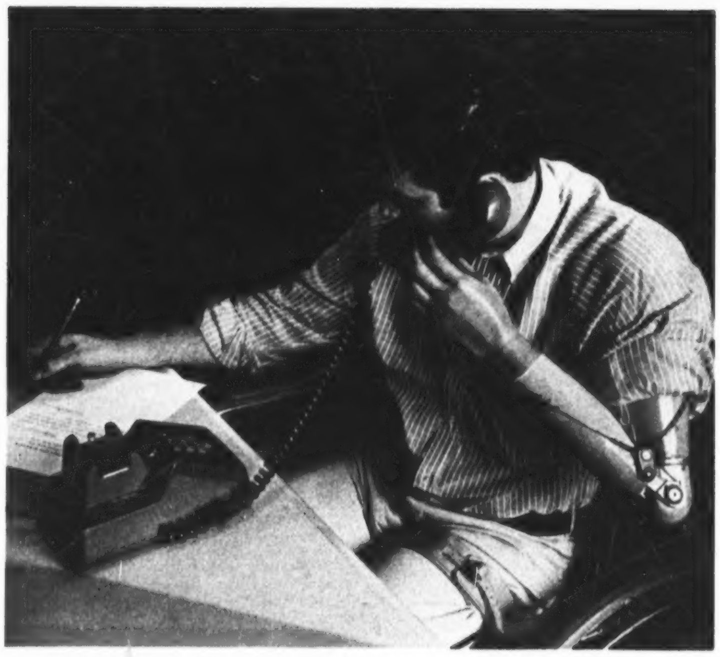
Neither the unilateral nor bilateral below-elbow amputee will have particular difficulty in using a telephone. When there is a need for extensive use of the telephone, a Speakerphone or handset-holding device will be helpful. (Unless a full 135° of flexion is possible, however, a handset held by the prosthesis will not reach to the ear.)

The unilateral above-elbow amputee may occasionally use his prosthesis to hold the handset (Fig. 28), but for extensive use of the telephone he may prefer "hands-free" equipment.

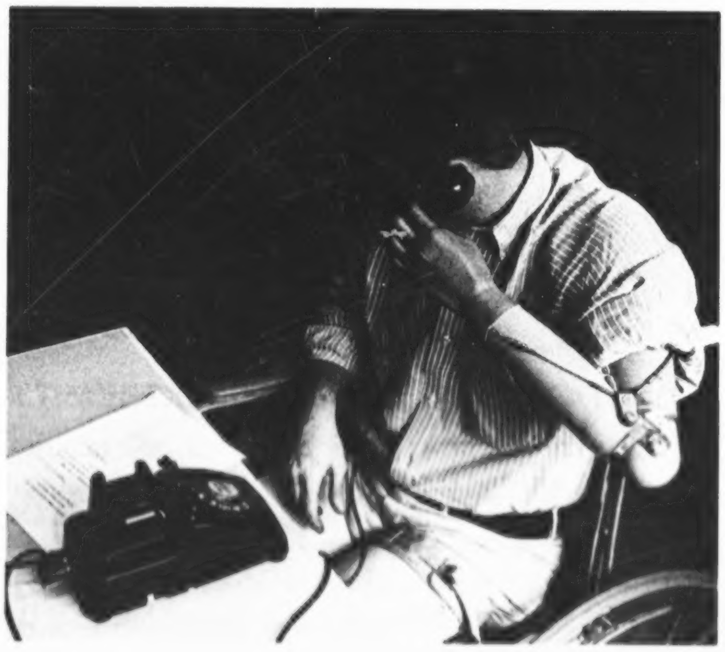
The amputee with a unilateral shoulder disarticulation will be unlikely to use his prosthesis for telephoning.

The accompanying table indicates the equipment found useful for the different levels of amputation.

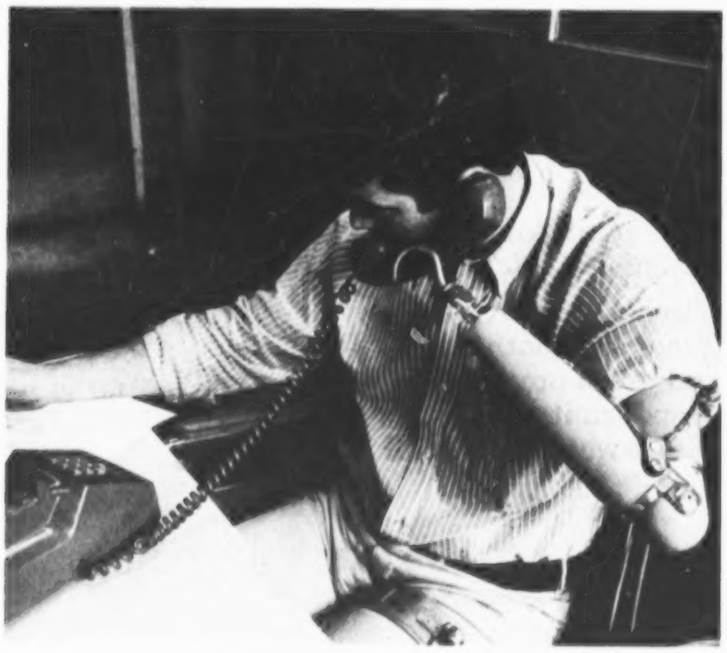
Because amputees in any one category will differ from one another in level of amputaton and skillful use of prosthesis, a patient should be given the opportunity to test any of the equipment he believes would be helpful.



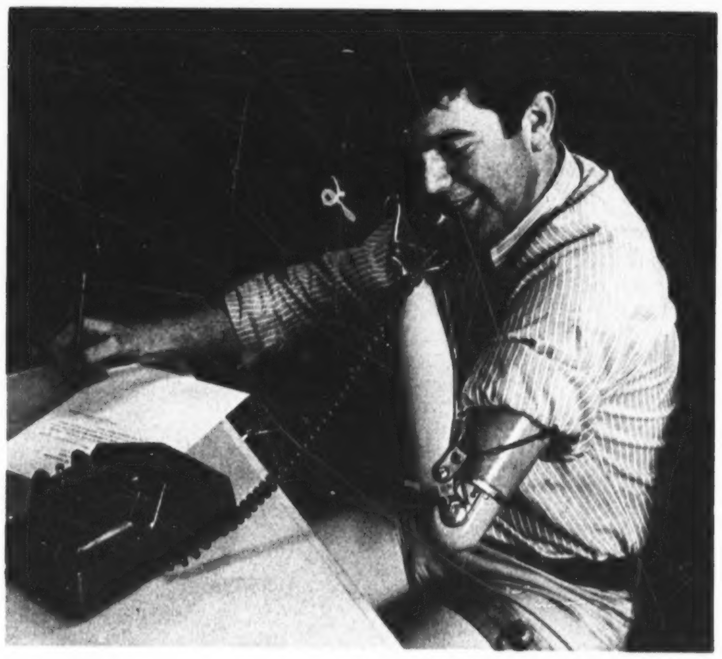
28a



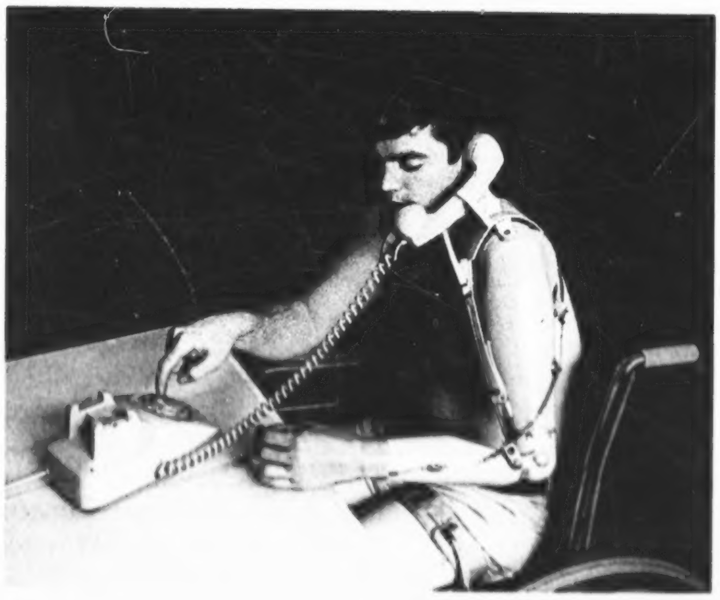
28b



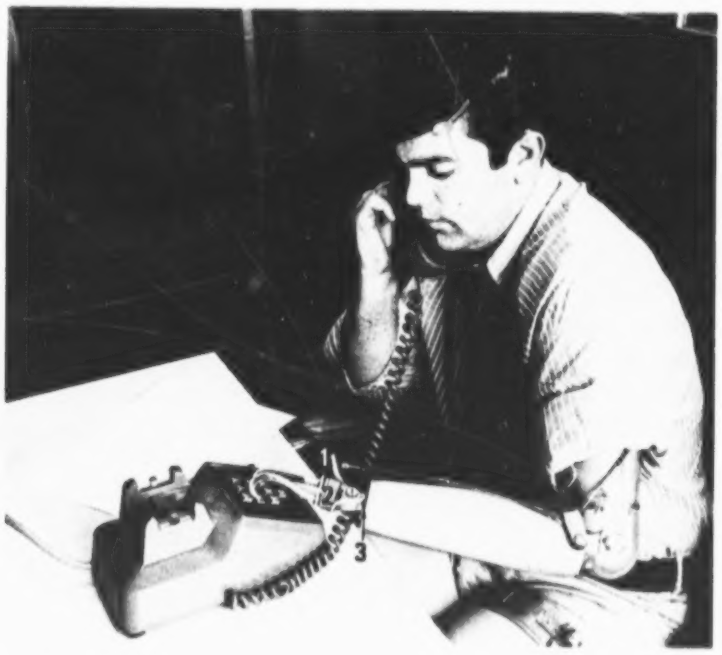
28c



28d



28e



28f

FIGURE 28

The Above-Elbow Amputee.

(28a) Although the APRL hand may be used by this amputee to hold a G3 standard handset, the weight of this hand, together with the abducted position of the arm and the necessary slight turn of the head, makes this an uncomfortable position to hold for a lengthy period of time.

(28b) The Wear-it-or-Hold-it handset is lighter in weight than the G3. But its use is also precluded by the abducted position of the arm and the excessive rotation of the head necessary for placing the ear and mouth to the set.

(28c) The standard handset may be held by the prosthetic hook, but in order to place the handset to the ear on the same side, the arm must be positioned in abduction. This is not a comfortable position to maintain.

(28d) Holding the handset in the distal curve of the hook and placing it at the opposite ear may allow a more comfortable position. The handset must be placed into the hook by the other hand.

(28e) A shoulder rest is helpful, particularly since it can have a secure resting position against the top rim of the prosthesis.

(28f) A prosthetic hook is an excellent dialing tool.

APHASIA

A Card Dialer may be useful, both to the person unable to recognize numbers and to the person who cannot manage all seven of them. Locating a name and number in a list or directory will be difficult or impossible, and the cards provide an excellent method of storage for easy retrieval. The person who has difficulty in reading names may require a different method of identifying the cards. Such methods are described on p. 107.

The aphasic person left alone in the house, who would be unable to communicate outside in case of emergency, could have the card for the number of a relative or friend left in the telephone ready for use. It is assumed that this person could recognize that the unidentified person calling would be the aphasic needing assistance. It is not known whether, in stress of an emergency, the aphasic person would be able to use the Card Dialer. Other methods of summoning assistance are described on p. 131.

BLINDNESS

The problems that the blind person encounters are mainly in the area of dialing. He is able to use a manual dial by touch, but is unable to use a telephone directory. Another problem is in knowing which line to use when a 6-button telephone rings. (See "Signalling Devices," and "Tactile-Visual Set," pp. 49, 50, for the deaf-blind.)

Dialing.

The Touch-Tone dial is the easiest to use since buttons are arranged in four rows and are quickly identified. Finding the desired finger holes on the rotary dial is more difficult. The following techniques are recommended by agencies that serve the blind:

METHOD 1: Four fingers of the dialing hand are used to locate the digits. When dialing with the right hand, the little finger locates the stop, and the ring, middle, and index fingers are placed in the "1," "3," and "5" holes, respectively. In dialing any one of these three digits the finger associated with that hole is used. To locate the digits "2" and "4", it is merely necessary to move one finger one position.

By similar maneuvering with the fingers over the "zero," "8," and "6" holes, the remaining five digits on the lower half of the dial are quite readily negotiated.

METHOD 2: When dialing with the right hand, the hand is placed at the top of the dial with the index finger at "4," middle finger at "3,"' and so on. By raising all but the finger on the desired number, any of the four numbers can be dialed. By shifting the index finger one space, the "5" can be dialed.

Similarly, the hand is placed at the bottom of the dial, with the index finger at "7," middle finger at "8," and so on. "7" or any higher digit can be dialed by raising all but the finger on the desired number. "6" can be dialed by shifting the index finger one space.

METHOD 3: The index finger of the dialing hand is placed on the finger wheel against the finger stop. The finger is moved lightly around the surface of the wheel with a counter-clockwise circular motion. The number of holes passed over are counted, stopping at the digit desired. After dialing that digit, the index finger is placed at the finger stop again and the next digit is treated similarly.

Directory.

Telephone numbers can be obtained by dialing "information" but this is not always convenient. The person who makes many calls to the same numbers, such as a travel agent who must call for airline and hotel reservations, is greatly aided by the Card Dialer (Fig. 29). The cards are identified by adhesive-backed braille tape and are stored in the storage bins of the telephone.

The person who travels can carry a braille notebook with his personal list of numbers. A pocket brailler enables him to add to it as necessary.

6-Button Telephone.

A blind person cannot tell which line he should answer for an incoming call, since this is signalled by a lighted button. Nor can he tell which line is free for his use when he wishes to make a call.

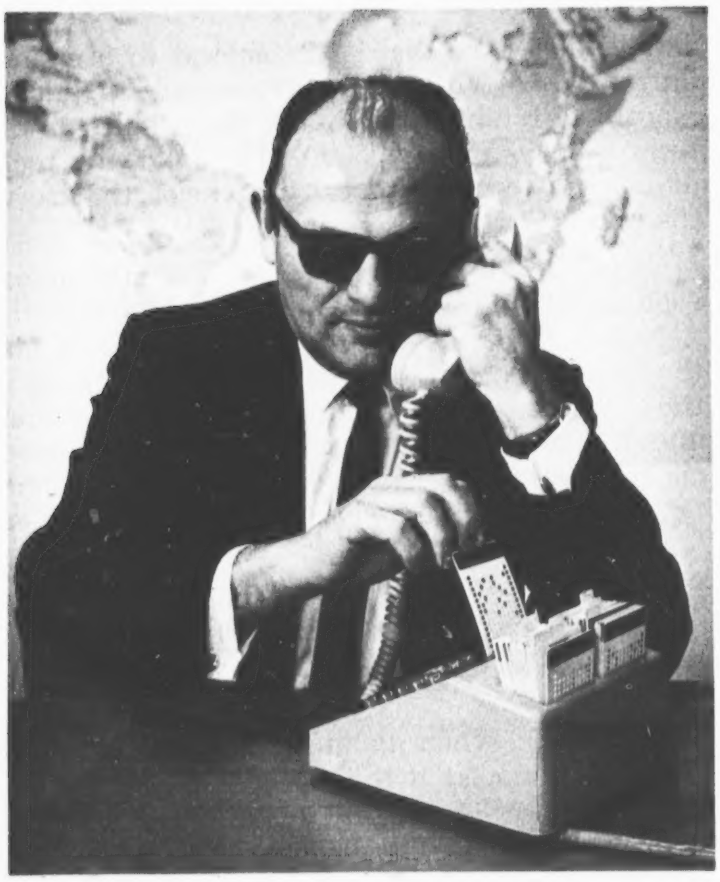


FIGURE 29

Blindness.

A Card Dialer provides a convenient method of dialing for the person who is blind. Cards identified by adhesive-backed braille tape are stored in the telephone, forming an easily-identified directory.

FIGURE 30

Deafness.

A watchcase receiver provides a means by which a person who is totally deaf can have a telephone conversation. An assistant monitors the conversation and repeats inaudibly the words of the distant party. The deaf person reads his assistant's lips and replies in the normal manner.

A special arrangement can be made available that will allow him to hear whether a line is ringing, is on "hold," or is free (see p. 48).

Switchboard.

A Seeing-Aid probe is available to enable a blind switchboard attendant to locate the lighted lamps on a switchboard (see p. 49) or Call Director.

Coin Telephone.

A difficulty arises for the blind person when he is asked by the operator for the number of the coin telephone from which he is calling. Coin telepones in protected environments, such as in a hospital or an institution, may be identified by adhesive-backed braille tapes. This should be discussed with the Marketing Coordinator.

DEAFNESS

A person with a hearing loss encounters two difficulties: knowing when the telephone is ringing and hearing the conversation of the distant party.

Signalling Devices.

Various services available to provide a visual or tactile signal are described on p. 49.

Receivers.

Amplification up to about 25 dB is provided by an impaired hearing handset, p. 49. A bone conduction receiver is available for persons with a conductive hearing loss due to middle ear dysfunction, p. 49.

The person with a total hearing loss must receive information through the sense of sight or of touch. A watchcase receiver (Fig. 30), a tactile visual set, a teletypewriter, or a telewriter can be used. The use of these is fully described on p. 50.

NEUROMUSCULAR INCOORDINATION

Equipment for Conversation

Handsets.

The evaluation procedure will have indicated whether or not the patient should attempt to use the handsets, and if it will be necessary for the evaluator to protect the patient's head during his first attempt (see p. 69). Both handsets should be tested since it is not possible to predict the patient's ability to use one rather than the other.

Shoulder rest.

A shoulder rest may be very useful to the person able to place a handset by his head but unable to maintain it in position.

Speakerphone.

This unit is excellent in all cases of loss of control. In some rare cases, the transmitter may need securing to a surface. A volume-control wheel should replace the knob. Occasionally, the paddle-lever device should be used. A 6017-type key will assist the person with a severe loss of control.

Gooseneck Arm.
This device may be useful if the person can move toward it and maintain this position as necessary.

Headsets.
The person is unlikely to be able to place a headset on his head, but this cannot be known until it is tested. The lightweight headset on eyeglass frames would be easiest to place in position independently.

Switches.

Tests will reveal whether a lever, pushbutton, or toggle lever is most appropriate.

Dials.

A *Touch-Tone dial* is preferred since the single movement necessary for depressing a button is least likely to aggravate any loss of control. Resting the wrist or elbow on the telephone or on the surface where it stands may help the patient gain some control. Positioning the dial appropriately may be important. A *rotary dial* is difficult to use. A "ball" dialer may be of assistance. The "grooved-knob" dialer should not be used since it can jam in the dial hole and break the dial fingerwheel. A *Card Dialer* should be tested (see p. 105). Using a card to call the operator may be of great assistance, but the severely affected person may not be able to depress the card completely down into the slot. *Manual service* may be necessary.

Remarks.
The patient should be sitting comfortably and should not have to reach any distance to operate the equipment, since difficulty in either factor will tend to aggravate his incoordination. Periods of rest between tests will be helpful.

MUSCULAR DYSTROPHY

Equipment for Conversation

Handsets.
Muscle weakness at the shoulders will mean that the person cannot reach forward. He may need to use both hands to lift a handset to the ear. The Wear-it-or-Hold-it set will be easier to lift.

Handset-holding devices.
A gooseneck arm may be preferred to an extension arm. It is unlikely that a shoulder rest will be helpful.

Speakerphone.
This is an excellent choice. Modifications of the volume-control knob and the buttons will be necessary for the patient with poor hand function. A separate switch (e.g., 6017-type key) will assist the person unable to reach the transmitter, who may also prefer to replace the desk telephone with a separately housed dial.

Headsets.
The lightweight headset, when worn on eyeglasses, will be the easiest headset to position on the head. When the patient wishes to use a headband, the operator's headset will be preferred.

Switches.

Lifting the handset to answer a call may be so slow and laborious that the patient will prefer to leave the handset permanently off the switchhook and use a switch in order to answer a call more quickly. The type of switch will depend upon the person's function.

Dials.

Either the Touch-Tone dial or the 9-type rotary dial may be suitable. *The technique described for using the "grooved-knob" dialer (see p. 94) is particularly appropriate to the patient with muscular dystrophy.* His finger and wrist function allows him to use the dialer as a post. Manual service may be necessary for the more severely affected person.

THE ONE-HANDED

Losing the use of one arm does not affect use of the telephone, but it will interfere with those concurrent actions that require a hand free from holding the handset, such as referring to papers and taking notes. "Hands-free" equipment for conversation may be essential. (The telephone sets that can be used with some of the following equipment are described on p. 85.)

Speakerphone.

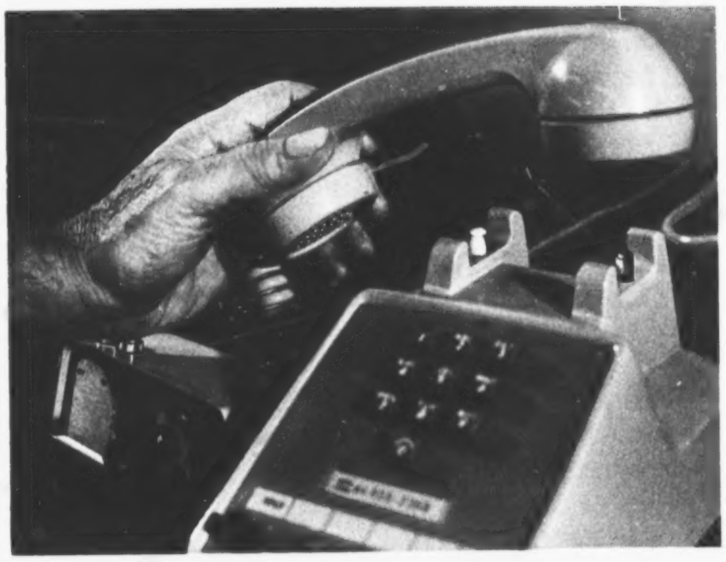
A special technique may be used to transfer a call from loudspeaker and transmitter to the handset. Normally this is done by holding down the "on" button with one hand while replacing the handset on the cradle and switchhook with the other. The person with the use of only one arm may accomplish the transfer by positioning the desk telephone and the transmitter unit near each other; holding the handset at the mouthpiece end, he depresses the "on" button by his wrist until he has dropped the handset onto the cradle and switchhook (Fig. 31).

Lightweight headset.

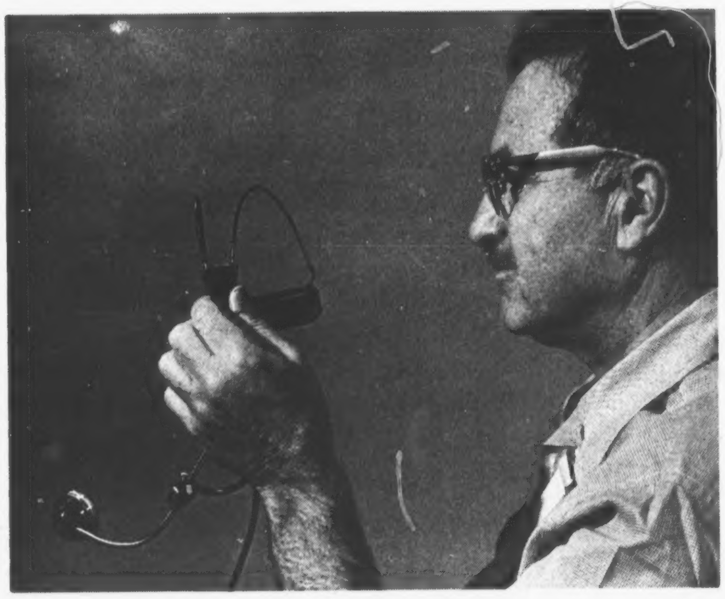
Attaching this headset to eyeglass frames allows the person with the use of only one hand to place it on his head more easily than when the headband is used.

Operator's headset.

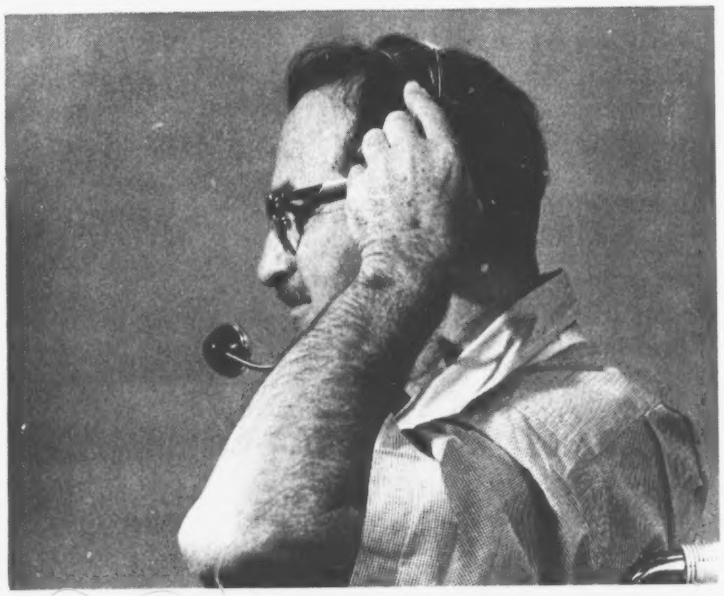
To place this headset on the head with one hand requires dexterity and practice. If the person is easily able to adjust the transmitter arm after the headset is on the head, the exact manner of putting on the headband is not important. Nevertheless, the necessity for adjustment of the trans-



31a



31b



31c

FIGURE 31

"The One-Handed."

(31a) Speakerphone. Transferring a call from the handset of the telephone to the Speakerphone normally takes two hands: one to replace the handset while the other holds down the transmitter "on" button.
After placing the units next to each other, the person with the use of only one hand can accomplish the transfer by grasping the handset as near to its end as possible and keeping the "on" button depressed with his wrist until the handset has been dropped onto the switchhook.
(31b, c) Operator's headset. The fingers and hand grasp the preadjusted transmitter arm and headband. The headband must initially be placed across the top of the head to prevent a loss of adjustment.

mitter arm is lessened when the headband is initially placed across the top, rather than to the back, of the head (Fig. 31).

The person should hold the earpiece with his hand and control the headband by his fingers. He should raise his arm and hand over his head so that the rubber pad of the headband can be lodged above the opposite ear, and then lower his arm to place the headband across the top of his head. The transmitter arm can be adjusted by the first finger and thumb while the other fingers hold the headband. Further adjustment by rotation of the transmitter arm and transmitter can follow. The correct position for the operator's headset is shown on p. 34.

If the disabled person has difficulty in understanding where the headband should be placed, a rubbing pressure applied across the top of his head during the testing situation will provide a cue. The use of a mirror for practice may be helpful.

Wear-it-or-Hold-it headset.

This headset is easily placed on the head with one hand, but its heavy weight produces discomfort. It should be suggested only to those who will use it for short periods of time. (See Example 6, p. 65).

Extension arm and gooseneck arm.

Either of these holding devices may prove useful. The extension arm may be preferred by the person who leans forward to take notes.

Shoulder rest.

Suitable for the person who finds it comfortable (see also p. 37).

PARKINSON'S DISEASE

Arm tremor.

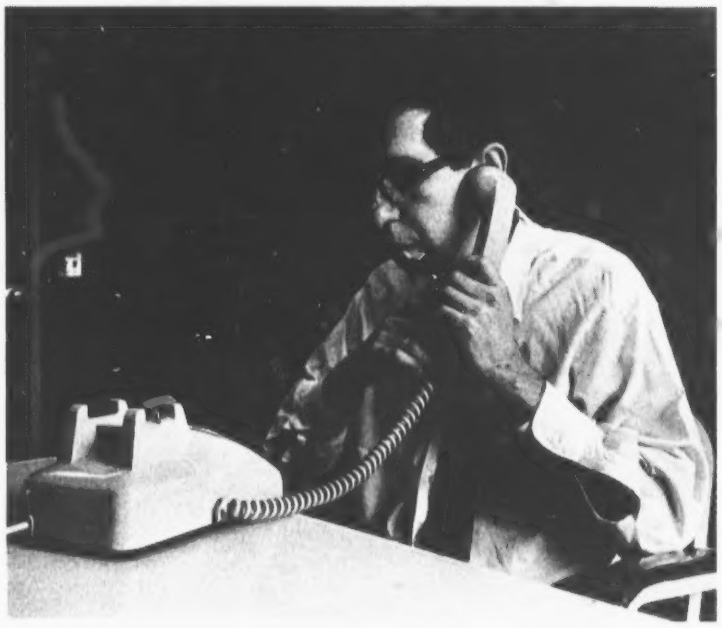
The tremor is not usually sufficient to affect dialing. The weight of a standard handset may decrease the tremor more than the lighter Wear-it-or-Hold-it set, but should the tremor be severe enough to affect the ability to keep a handset by the ear, a Speakerphone or headset should be considered.

Arm rigidity.

Dialing is rarely affected by arm rigidity; the principle difficulty may lie in the use of a standard handset. When the rigidity is severe, it may be accompanied by an apparent loss of awareness of the position of the arm holding the handset; the arm may gradually slip down so that the transmitter falls beneath the chin (Fig. 32). As a result, the user no longer speaks into the transmitter and cannot be heard in conversation. (The loss of voice volume that is also an effect of Parkinson's disease is described later.) The patient who is able to rest his elbow on the table may prevent his arm from displacing downward.

When a standard handset is used, the depression of the arm holding the handset appears to worsen. Therefore, the lighterweight Wear-it-or-Hold-it handset should be tested.

If the person is unable to alter his method of using a handset, or to benefit from the Wear-it-or-Hold-it set, a Speakerphone may be helpful when the transmitter can be located as near as possible to the patient's mouth.



32

FIGURE 32

Parkinson's Disease.

The person with Parkinson's disease may lose awareness of the position of the handset and allow it to drop below his chin. His voice may not be transmitted adequately and he will not be heard clearly.

Speech.

The weak-speech handset will be of great assistance to anyone who has diminished voice volume, but only if the additional 2 oz. in weight of this handset does not pull the transmitter end away from the mouth and compound the problem. The ability of the patient to maintain this position may be tested by having him use the handset during a telephone conversation for a few minutes. (This conversation over the handset is important, as it provides a signal to the patient to keep the receiver in place.)

THE PERSON WITHOUT ARM FUNCTION

Included in the category "The Person Without Arm Function" are those patients whose congenital or acquired pathological conditions result in both upper extremities being considered as having no function. This class of disability may be subdivided into (A), those with slight motion in the arms or other parts of the body; (B), those with good motion of the trunk; and (C), those with motion only at the neck and head. These subdivisions are discussed in greater detail later.

The Order of Testing

The individual items of equipment that the patient can use are found first. The area the patient can reach will be very limited, so a method of arranging the units is then devised. The arrangement must not interfere with any of the patient's other activities. For example, the arrangement must allow room for a book if he wishes to be able to read, for writing, or for the controls of a motorized wheelchair. Additional points that may be helpful will be found under "Wheelchairs," pp. 125-127, and "General Factors Influencing the Choice of Telephone Equipment," pp. 58-66.

The choice between systems may depend upon the patient's need for a telephone and the amount of use he will have, the financial cost, the availability of assistance, or the need for complete independence.

Suitable "Hands-Free" Equipment for Conversation

For Related Telephones: Consult "Testing Equipment for Conversation" (pp. 85, 86).

Speakerphone: Excellent, higher cost, does not provide privacy. The buttons may need enlarged tops or a paddle-lever device may be helpful. A volume-control wheel will be necessary. The three units may take up too much space; however, a separately housed dial may be substituted for the desk telephone. A wheeled cart, plus wall jacks, may allow transfer between rooms.

Lightweight headset: This is the preferred headset because of its light weight. It allows privacy. An assistant will be required to place it on the patient's head.

Operator's Headset: Heavier, economical, allows privacy. Not suitable for use when reclining. An assistant is necessary.

Gooseneck Arm with Wear-it-or-Hold-it set: Economical, excellent when the patient is able to move toward it and away.

Standard Handset: It may be secured to an upright surface by the clamp of a shoulder rest (Fig. 35). For temporary use when the patient is away from his own telephone, a gooseneck arm with spring clamp is useful (see p. 37).

Remarks: A Speakerphone may be used by persons in all these categories (independence in dialing will depend upon Touch-Tone service being available) and has the advantage of allowing the incorporation of a separate switch (microswitch when necessary or 6017-type key) without significant extra cost. The Speakerphone may not always be suitable, however, for reasons of economy in cost or privacy of conversation.

Microswitches.

The term "microswitch" is used here to refer to any special assembly switch which takes minimum pressure to operate. It would include such devices as mercury switches—which operate by a change in position.

The severely disabled person may have only one effective movement and should not be expected to operate two separate switches. Therefore, when a microswitch is used, it should be associated with control relays so as to be double acting; i.e., one push is "on" and another push in the same direction is "off."

Whenever possible, the use of a microswitch should be avoided, since *a microswitch on any equipment entails the addition of relays, and extra costs will be incurred.*

Use of a microswitch.

1) It must be positioned so that it cannot be operated by any inadvertent movement or when the patient changes his position for comfort.

2) It must be secured so the mounting is rigid and cannot be displaced.

3) The movement to operate it must not be one that tires the patient.

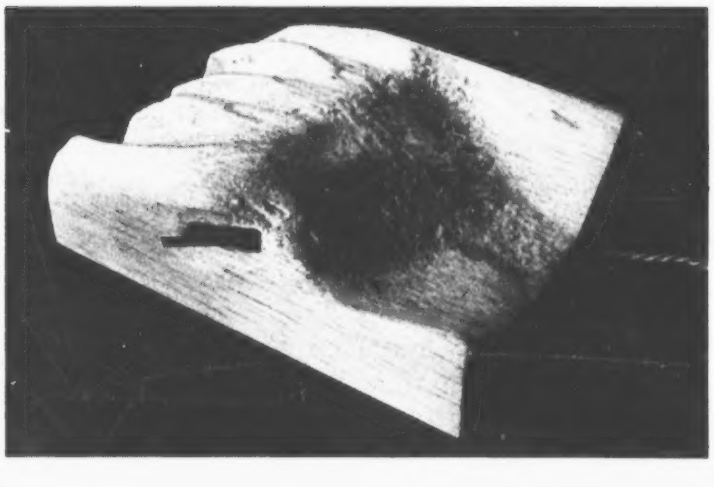
4) It should be simple for the family or an assistant to position accurately each day.

Positions for Standard Switches and Microswitches

Movements and Switches.

Finger or Thumb.

When a finger or thumb has sufficient strength, a

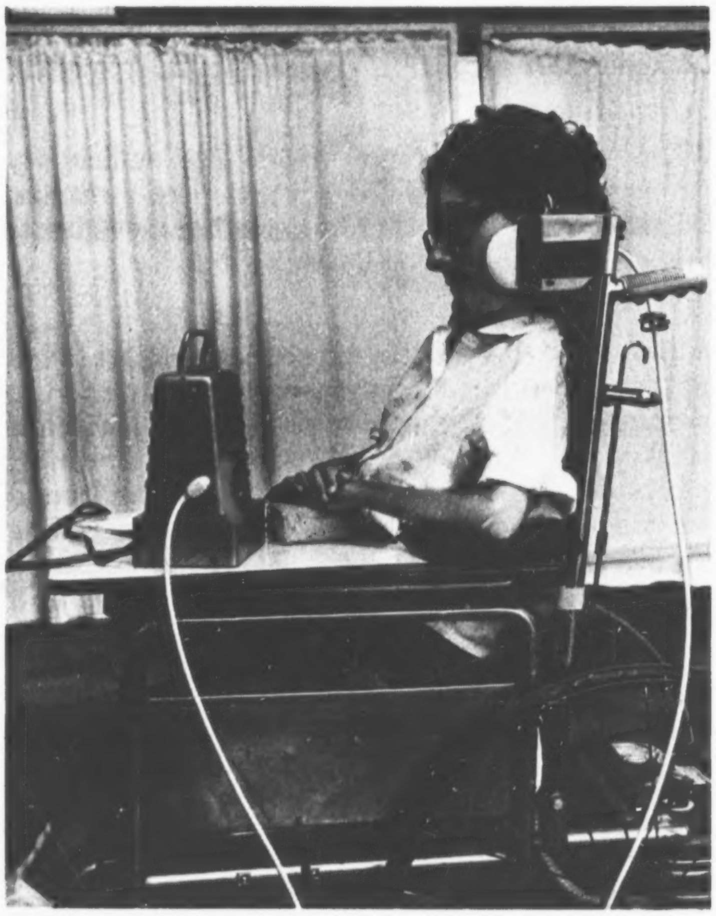


33a

33b

33c

33d



33e

FIGURE 33

Mountings for microswitches.

(33a, b, c) Thumb operated. Mounted on a block. Minimal force and movement are needed to operate a microswitch. A block on which to rest his hand allows a patient to utilize a flicker of flexion in his thumb.

(33d) Shoulder operated. Mounted by clamp to the wheelchair. A lever is positioned over the shoulder, and the rod on which it is mounted is placed into a clamp on the wheelchair frame.

(33e) Head operated. Mounted in the headrest opening of a wheelchair. This patient is able to turn her head against the remote pressure switch to operate the school-to-home equipment. She has no functional motion other than this one in her neck.

The pad of the switch is held in place on the mounting by "Velcro." The mounting consists of a flat board bracketed onto a tube. The tube is inserted into the opening in the wheelchair frame, normally used for a hook-on headrest.

As this patient's neck is very weak, she rests her head against a metal support (not visible).

(d. Spinal Cord Quadriplegic, Group B.)
(e. Postpolio.)

6017 key or Speakerphone transmitter button may be used, if it can be positioned appropriately.

An isolated trace of movement in the hand can operate a microswitch if this can be positioned to take advantage of it. For example, a support on which the hand rests may allow the switch to be operated by a flicker of flexion in the thumb or finger (Fig. 33a, b, c).

Shoulder—elevation.

A microswitch may be attached to a projection from the wheelchair and placed over the top of the shoulder (Fig. 33d). This projection may be inserted into the headrest opening of the wheelchair frame, or the clamp for an overhead rod. As a person elevates his shoulder, his elbow will be lifted. When he can control the direction in which his elbow lowers again, a place on the arm of his wheelchair may be found for a microswitch. (The person who can control his arm movements but cannot control his hand may be able to use his elbow to operate a pushbutton or lever switch; experimentation will be necessary to find the most suitable kind.)

Hip—rotation.

A microswitch may be placed by the side of the patient's knee on a wheelchair upright or on a desk leg. This position is excellent since it allows the most freedom and is least likely to be operated inadvertently.

Hip—flexion

A microswitch may be placed over the knee. (If the movement is sufficiently strong, and includes the ability to abduct and adduct, a 6017-type key could be mounted with the lever pointing downward.)

Foot—rotation at heel or toe.

A microswitch or other switch is placed to the side of the heel or toes.

Foot—plantar flexion.

A foot switch may be used but unless the person can rest his foot on it or pivot his foot on the heel to swivel the forefoot over onto the switch, he has to be able to lift his leg to place his foot onto the switch. This is a movement needing strength at the hip and is the equivalent of using an over-knee switch.

Toe movement.

In the rare occurrence of the disabled person having movement only in his toes, a microswitch can be used if it is possible to place it appropriately.

Head—rotation.

A microswitch is placed by the side of the head (Fig. 33e).

Head—flexion.

This movement can be used only when the person has the strength in his neck extensors to raise his head again. A microswitch may be placed on a gooseneck arm to be bent under the chain as necessary or on a special platform attached around the neck.

Jaw movement.

Microswitch, under the chin, as above; strength in the neck will not be necessary.

(Note: Any switch placed by the head must not inadvertently be operated by such actions as speaking or yawning and must allow the person to change his position for comfort. A switch placed by the head has disadvantages and it is preferable to utilize other movements the patient can employ.)

By Holding a Pencil in the Mouth.

Standard switches may be used (suitable for the patient with good motion in his trunk, Fig. 35).

By Holding a Long Mouthstick.

Speakerphone buttons, line buttons, lever switches, 6017-type key (The mouthstick should have a resting place from which it may be picked up by the mouth, Fig. 36).

Remarks: With the exception of use of a mouthstick or pencil, all of these positions require accurate evaluation of the direction of the person's movement, the construction of a platform to which the switch is attached, and the likelihood of its accurate placement each day for use. The patient may wish to use the telephone in more than one location and this must be taken into account (see "Wheelchairs," pp. 125-127).

EVALUATING THE PERSON WITHOUT ARM FUNCTION

Equipment for conversation may be discussed and demonstrated first, principally to discover whether the patient wishes to have the Speakerphone. (Its versatility will simplify the provision of telephone service.)

The various methods for positioning equipment may be considered but no final decisions can be made until a means by which the patient can operate a switch has been found, dialing has been discussed or tested, and the general factors of the patient's use taken into account.

(A) The Patient With Slight Motion in the Arms or Other Parts of the Body (Fig. 34)

Equipment for Conversation.

The choice between handset-holding arms and other items of "hands-free" equipment can depend upon whether or not the person has lateral trunk motion.

Movements and switches.

The Arm and Hand:

The person able to move his arm or hand slightly may be able to use the key of 4A key equipment when it is placed nearby. If the patient is interested in a Speakerphone, test whether he could use the transmitter buttons with enlarged tops, when placed appropriately. Either show the illustration of the paddle-lever device (p. 23) and discuss its use, or test the equipment, if desirable. Consider the use of a 6017-type key or microswitch.

Other Movements.

When neither arms nor hands are sufficiently strong to be used in the operation of switches, discuss with him whether he has other movements that could be used to operate a switch.

By Mouthstick.

While a mouthstick may be useful for operating a dial, and could be employed on a switch, the use of another part of the body to operate a switch is quicker and easier. Use of a mouthstick, however, may allow a greater choice of telephones and avoid the expense of a microswitch. When the preceding tests show the patient *cannot* use a standard switch, and if appropriate, ask whether he uses a mouthstick and discuss its use, as described in (C).

Dials.

Dialing should be discussed and the patient given opportunity to test the dials if he wishes. Using a dial may be impossible or too exhausting. The patient who can operate a switch may prefer to have manual service (if available).

If the patient is considering the use of a mouthstick, refer to (C).

(B) The Patient With Good Trunk Motion (Fig. 35)

The person with good trunk motion is one who can lean forward and back again and move from side to side. He may use his chin for operating switches or he may hold a pencil in his mouth.

Equipment for Conversation.

Speakerphone.

A Speakerphone will greatly aid the person who writes with a pencil held in his mouth.

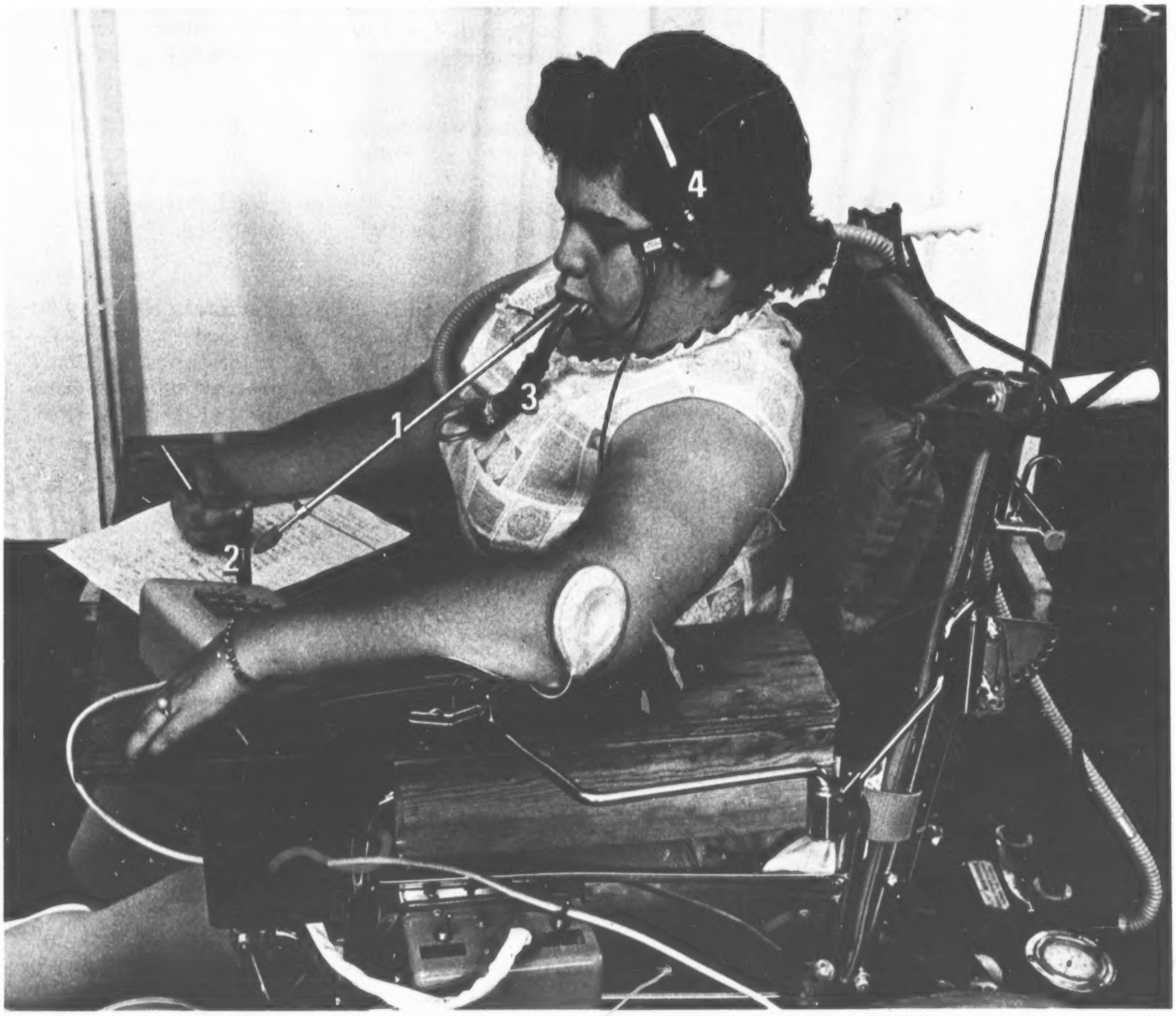
Standard handset.

A standard handset may be left off the cradle for the person to put his ear down to it or the clamp of a shoulder rest may be used to secure the handset in an upright position.

Some persons are able to pick up the handset between the chin and shoulder and roll it until it is in place between the shoulder and ear. (Its end may be used for depressing line buttons from this position when necessary.)

Gooseneck Arm with Wear-it-or-Hold-it handset.

A handset allows a private conversation. The disabled person may experience difficulty, however, if



34

FIGURE 34

"The patient with slight motion in the arms and other parts of the body."

A balanced forearm orthosis under this patient's left arm allows her to utilize its slight movement. Her left hand has minimal function, but she can move it over an area of about one square foot, and is able to move writing paper and the lever of the 6017B key. She can exert a downward pressure of about 2 ounces but this is not sufficient to depress Touch-Tone buttons. For this she is using a mouthstick (1).

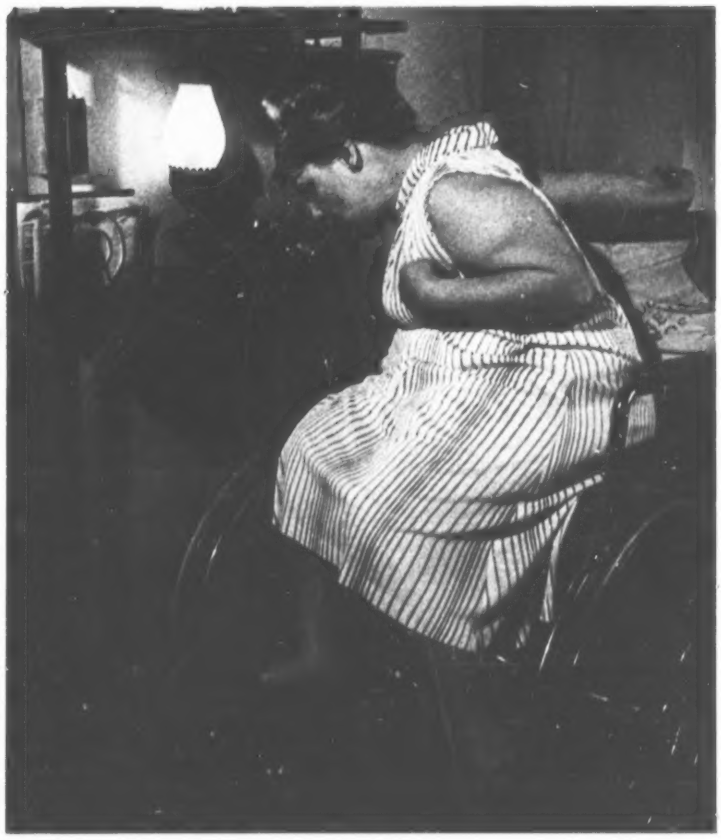
She has no function in her right arm other than being able to hold and use a pen and she needs as much space as possible on her lapboard for writing. The center space is taken by the control stick of her motorized wheelchair (2).

In her mouth she is also holding the hose of her positive pressure equipment for respiration (3). A lightweight headset (4) is the most suitable equipment for conversation (apart from the Speakerphone) because, unless a receiver and transmitter were mounted separately, a handset on a gooseneck arm could interfere with her use of the hose and mouthstick.

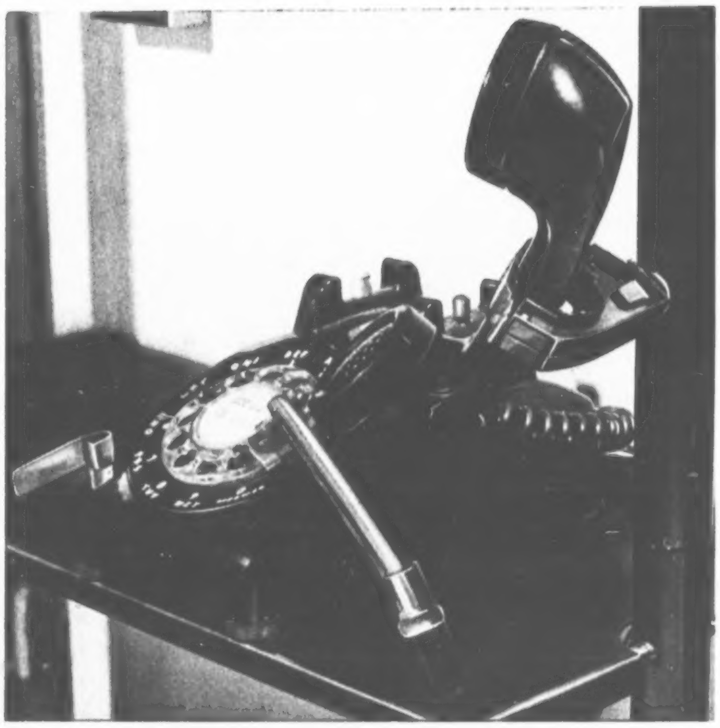
Any desk set on her lapboard would take up too much space, particularly as a set would be needed only for its dial. The smaller sized separately housed dial was more suitable and led to the choice of 4A key equipment. Due to a special circumstance, the jack and key unit could not be placed under her hand, so an auxiliary 6017B key was positioned on the wheelchair arm and the 4A key equipment was carried on the back of the wheelchair (not visible).

This arrangement did not allow her completely independent use of the telephone. The set had to be plugged into a wall jack and the headset placed on her head by an assistant.

(Postpolio.)



35a



35b

FIGURE 35

"The patient with good trunk motion."

(35a) This patient with athetoid cerebral palsy is unable to use her arms but can operate a 2½-inch lever by her chin or by a pen held in her mouth.
(35b) A telephone installation that she can use without assistance is provided by a standard handset held upright by a clamp of a shoulder rest, a lever over the turnbutton on the two-line telephone, and a dialer positioned ready for use.

he wishes to take notes of a telephone conversation by holding a pencil in his mouth, since this will require his moving away from the receiver.

Headsets.
A headset will usually require an assistant to place it on the head. Some persons who wear eyeglasses may have developed a method of putting them on independently. In this case, the lightweight headset could be used without assistance.

Dials.

Either the Touch-Tone or the rotary dial may be operated by a dialing tool (a pencil for the Touch-Tone dial or a "ball" dialer for the rotary dial) held in the mouth. Manual service may be necessary for those who cannot use, or do not wish to use, this method.

Remarks: Equipment must be placed to allow access to it and at the correct height. The person with good trunk motion may be independent in self-care and may desire complete independence in his use of a telephone.

(C) The Patient With Motion Only at Neck and Head (Fig. 36)

Those persons who have no motion except at the neck and head will be likely to have a mouthstick or to have tried one at some time. Some persons consider the use of a mouthstick unpleasant and do not care to use one. Nevertheless, some who object to a mouthstick might consider its use when it could permit independence in telephoning.

The person with neck and head movement only who does not use a mouthstick has the choice of (1) a microswitch—at extra cost—and manual service, (2) having assistance in the use of a telephone, or (3) learning how to use a mouthstick.

The person who uses a mouthstick can operate switches on standard telephones and use the Touch-Tone dial. (His ability to use a rotary dial is doubtful.)

The person who does not use a mouthstick may have infrequent use of the telephone and may prefer to continue having assistance. If he wishes to have some independence, however, the advantage of a mouthstick—for avoiding the necessity of a microswitch with its attendant additional costs—may be pointed out, and that when Touch-Tone service is available in his area, he would also be able to place his own calls.

Equipment for Conversation.

Speakerphone.

Excellent. Higher cost. Modifications will be necessary.

Headsets.

The lightweight headset is preferred.

Gooseneck Arm with Wear-it-or-Hold-it Handset.

The transmitter end of the Wear-it-or-Hold-it set can obstruct the use of a mouthstick on switches and dial, particularly if the person is able to turn his head to one side only. A separately mounted transmitter should be provided in this case. One example may be seen in Fig. 39, p. 129. If it cannot be mounted near the patient's mouth, it could possibly be clipped to a shirt or blouse, provided this position allows adequate transmission of speech.

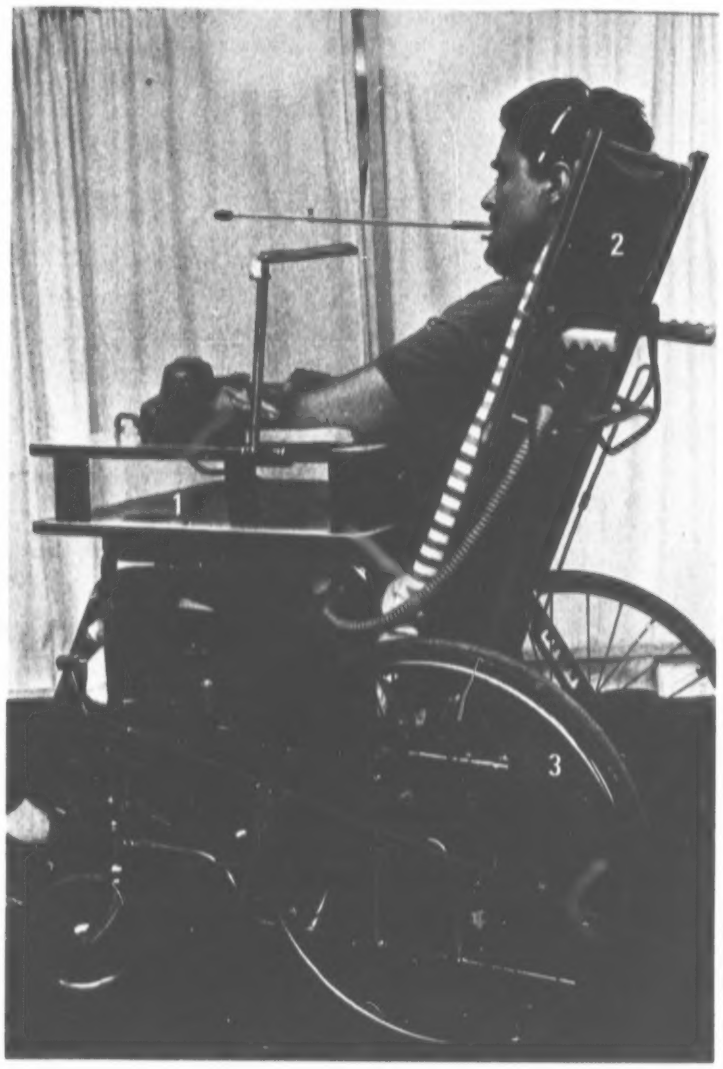


FIGURE 36

"The patient with motion only at neck and head."

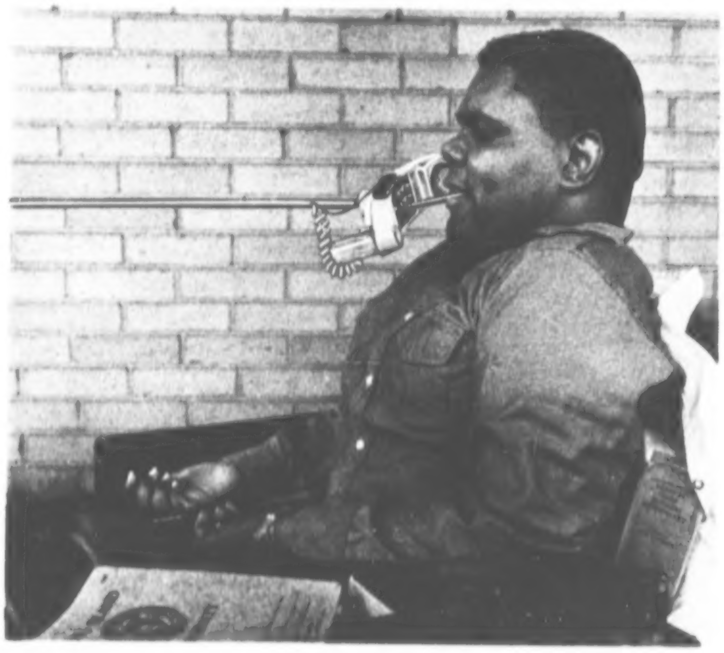
This patient has good strength in his neck musculature. He is able to take his mouthstick from its clip-on stand and use it to move the lever switch of the desk telephone with headset jack and press the Touch-Tone buttons. The large size of the desk telephone will not interfere with his use of space on his lapboard since he needs additional space only for reading material.

(Postpolio.)

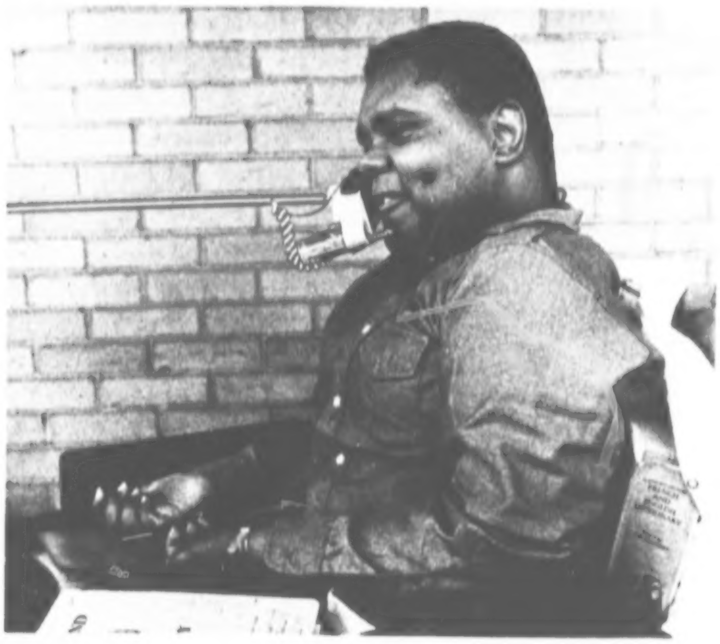
Switches.

When a long mouthstick is used, any standard switch may be operated. Test to find whether a pushbutton or lever switch is preferred. (See "Testing the use of a mouthstick," following.)

When microswitches are necessary, either a Speakerphone can be used, or electrical relays added (at



37a

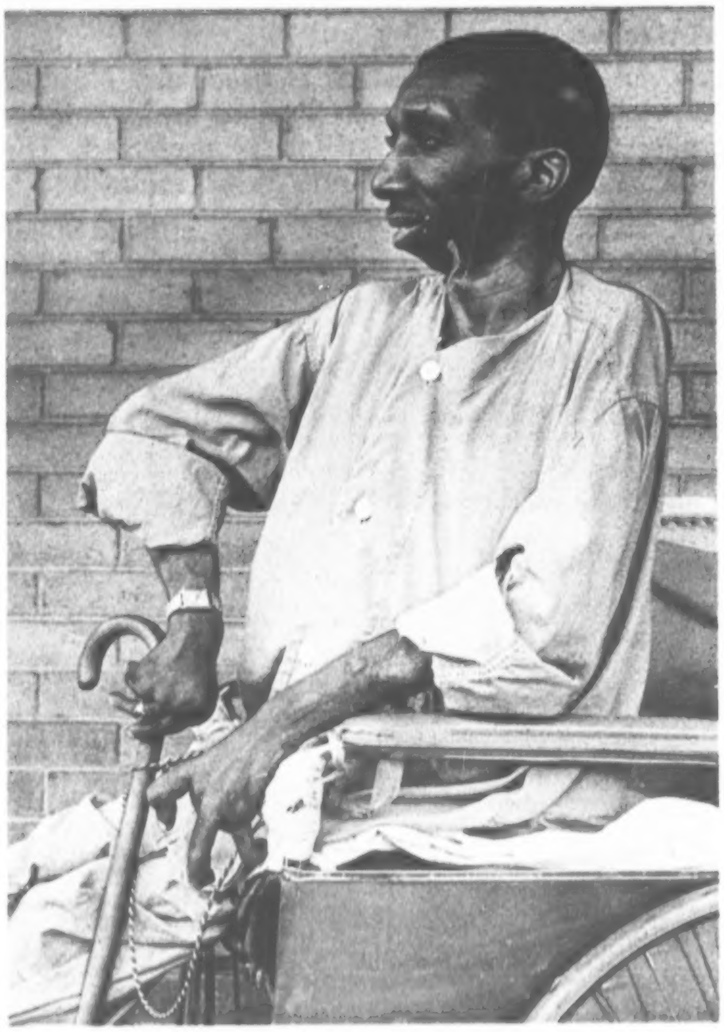


37b

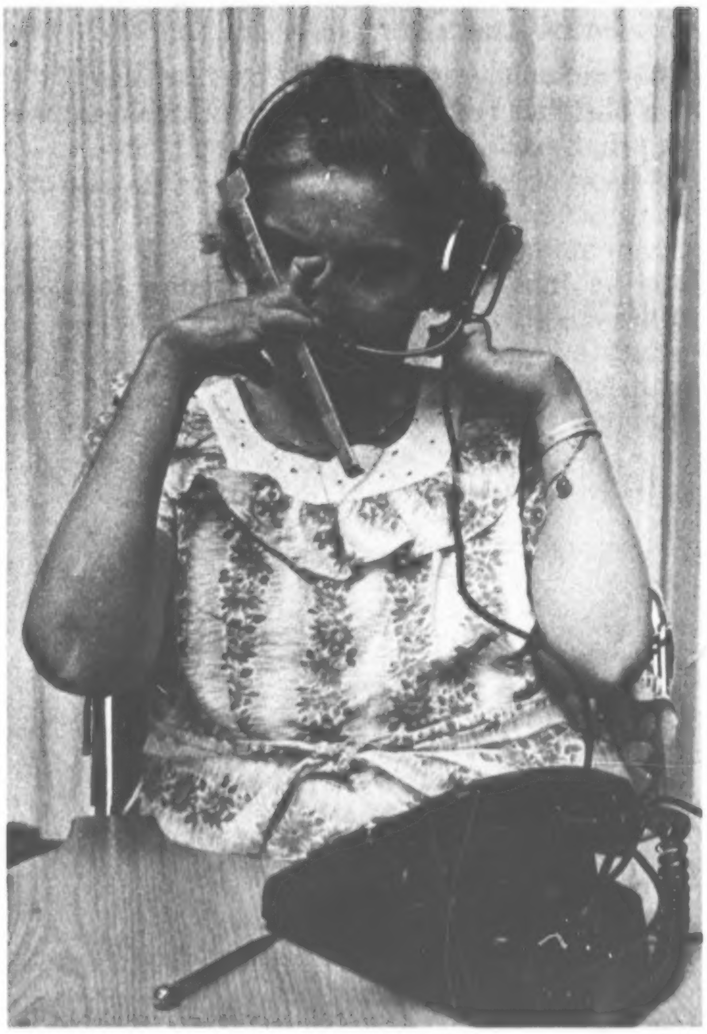
FIGURE 37

"The patient with motion only at head and neck."

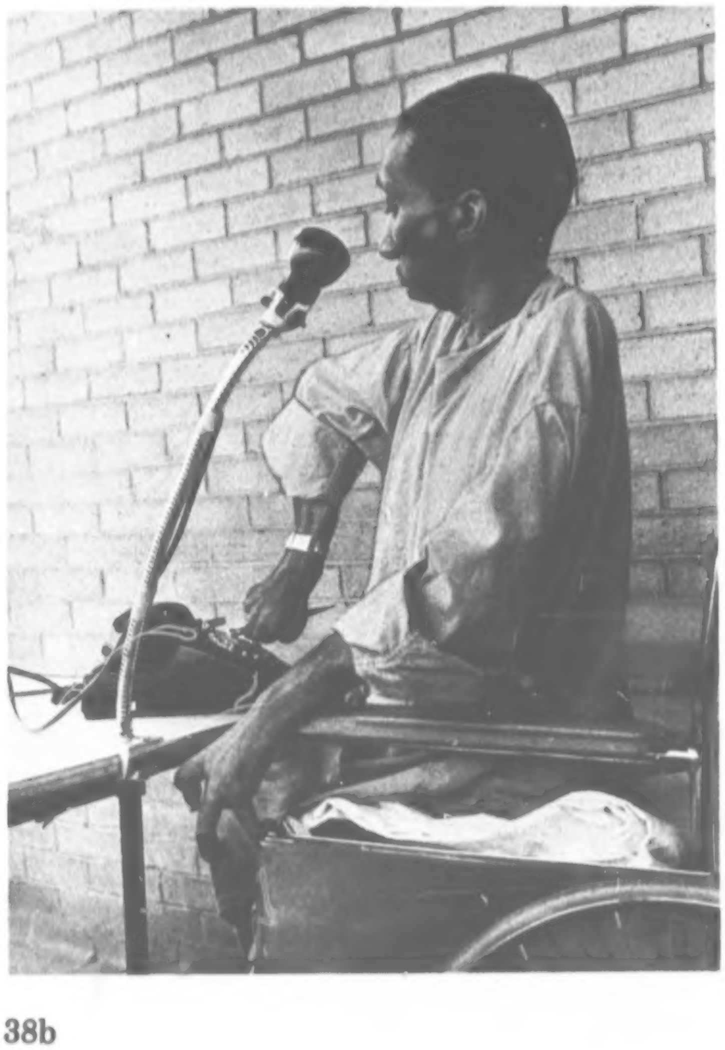
A Trimline handset is secured to a rod by a universal joint. A plastic tube taped to its end holds a short mouthstick used for dialing and for operating the microswitches that substitute for the switchhook. This special arrangement allows independent, private use of a telephone for the patient able to drive his motorized wheelchair into position.



38a



38c



38b

FIGURE 38

Rheumatoid Arthritis.

With the exception of some motion in the fingers of his right hand and at the scapulae, Mr. B's. joints are ankylosed. He propels his wheelchair by holding his cane and rocking back and forth to push with it against the floor.
But immovable joints are not in themselves a bar to using a telephone when suitable equipment is found and it is positioned appropriately.
(38a) shows the position Mr. B. maintains and (38b) shows that equipment (gooseneck arm, lever switch on the desk telephone with headset jack, and a dialing tool) may be placed so that he can operate the telephone.
(38c) Miss C. is unable to reach above her ears but she can put on an operator's headset without assistance by using a pushing stick.

Spinal Cord Quadriplegia

Group	"A"	"B"	"C"	"D"	"E"	"F"
Key residual functional motion (a functional level is not required)	Shoulder elevation	Elbow flexion	Wrist extension	Pronation	Wrist flexion	Some finger function
Assistive arm equipment	**Balanced forearm orthoses* and/or ?hand orthoses* and attachments, e.g., spring clip and pencil	?Hand orthosis and attachments, e.g., spring clip and pencil. ?Powered orthosis	?Hand orthosis ?Tenodesis orthosis ?Writing device	?Tenodesis orthosis ?Writing device	?Writing device	?Writing device
Trunk balance in wheelchair	Very poor. ?Muscle spasms	Poor. ?Muscle spasms	Poor to fair	Fair	Fair	Fair
Equipment for conversation	Speakerphone. ?Gooseneck handset-holding arm, but will not be able to move toward it. Headsets*	Speakerphone. Gooseneck arm, as "A." Operator's headset* ?Hold standard handset to ear if given it.* ??Use Wear-it-or-Hold-it handset (if fingers have tightness in flexion). ??Independent use of lightweight headset on eyeglass frames.	As for "B" PLUS: ?Use of standard handset ?Use of Wear-it-or-Hold-it handset. ?Independent use of lightweight headset on eyeglass frames. ?Extension handset-holding arm.	"B" and "C" but without (?). (Use of standard handset may not always be possible)	As for "D." Use of all equipment is easier.	This person can use any equipment. When he makes extensive use of the telephone, he may prefer to have assistance from a Speakerphone or handset-holding devices.
Switches	Speakerphone buttons (with enlarged tops or by paddle-lever device). †Levers ?Microswitch	Speakerphone buttons, as "A." †Levers	As for "B" PLUS ?Line button, (?"Cuff" and pencil)	As for "B" and "C" but by thumb or finger	Any switch by thumb or finger (but not hold-button without lever device).	
Use Touch-Tone dial	?"Cuff"* and pencil (only with BFO)	"Cuff"* and pencil	?Part of hand orthosis. "Cuff" and pencil.	By thumb	By thumb or finger	
Use rotary dial (9-type)	??"Cuff"* and dialing tool (only with BFO)	"Cuff"* and dialing tool	"Cuff" and dialing tool. ?Padded dialer.	By finger (See p. 100) Otherwise, by dialing tool and ?"Cuff".	By finger or thumb	
Telephones other than desk sets or 4A key equipment	No	No	Wall telephones: ?Touch-Tone dial by ?thumb or ?pencil (or ?"Cuff") ??Rotary dial, by dialing tool, (or ?"Cuff"). ??Card dialer.	Wall telephones: Touch-Tone dial by thumb. Rotary dial—by dialing tool, ?finger. ?Card dialer.		

? — May apply to some in this category.

?? — Accomplished by the exceptional person.

"Cuff" — A means of attaching a pencil or dialing tool to the hand, either a pocket or spring-clip of a hand orthosis or the addition of a universal cuff (p. 47).

† "Levers" — Lever modifications to turnbuttons or a 6017-type key.

* — Assistance from another person will be necessary to place this equipment in position.

** — It may be preferable to treat the person in this category who does not use BFO's as a "patient without arm function" (p. 115).

extra cost) to a desk telephone with headset jack, or to 4A key equipment. The special use of a Touch-Tone model Trimline set is shown in Fig. 37.

Dials.

A Touch-Tone dial may be operated by a long mouthstick. Using one on a rotary dial is very difficult and should not be advised. Manual service may be necessary.

Testing the use of a mouthstick.

There may be one location on the patient's lapboard where he can exert the greatest force from his mouthstick. This will be the position in which to place the appropriate switch for his test (headset lever switch of desk telephone with headset jack, or line button of 6-button one, key of 4A key equipment, buttons of Speakerphone transmitter, modified if necessary).

After he has demonstrated his use of the switch, it should be replaced by a Touch-Tone dial (where available) for him to test. When he can use both switch and dial at this one position, test to see whether he can use them when they are in other positions nearby, found by an analysis of his use of space. Be sure that these locations do not interfere with other activities he performs in this area, e.g., reading a book. Continue experimenting until locations are found for all the equipment. (Do not exclude special mountings for a dial or switch. See "Reclining-Back Wheelchairs," p.126).

When Touch-Tone service is not available, the patient may attempt to use a rotary dial if it can be mounted very near to his head, so that the mouthstick is no longer than 8 to 10 inches. A short "ball" dialer attachment should be placed on the end of the mouthstick. Caution should be observed that it does not put too great a strain on his teeth. The patient may find that he cannot use a rotary dial and may request manual service (if available).

Remarks: The person with motion only at his neck and head will always need assistance for his care and this may include the necessity of having the telephone equipment placed in position for his use. While complete independence in using the telephone may be desirable, its cost may be a deterrent to one who uses the telephone infrequently.

RHEUMATOID ARTHRITIS

Equipment for Conversation

Handsets.

The person who can use a handset may prefer either the standard or the Wear-it-or-Hold-it handset. Both should be tested.

Speakerphone.

Excellent. Enlarged tops to the buttons may be helpful.

Handset-holding devices.

Either a gooseneck arm or extension arm may be suitable. When the inability to use a handset is due to loss of joint range of motion the gooseneck arm will be preferred. A shoulder rest is rarely suitable.

Headsets.

The choice will depend upon whether the person wishes to use the lightweight headset on eyeglass frames or the operator's headset on a headband. The person who has a pushing-stick may use it to adjust the headband (Fig. 38).

Switches.

The type of switch selected may depend more upon the person's ability to reach it than upon its method of operation, although, generally, lever switches will be easier to manage than stiff pushbuttons.

Dials.

The Touch-Tone dial may be advantageous, but occasionally the act of pressing buttons is painful and the rotary dial may be preferred. A "ball" dialer will be helpful and is recommended for use by a patient whose fingers have been affected by the disease process.

SPINAL CORD QUADRIPLEGIA

Quadriplegia following a spinal cord lesion at a specific level will result in a loss of function of muscles innervated below the lesion and can produce a predictable pattern of residual function. When the lesion is not complete, the residual function may be different in either arm. The tabulation that follows on p. 123A, of the use of the telephone by the spinal cord quadriplegic, is listed according to the arm with the highest level of residual muscle function. *The levels in the table do not imply that the muscle strength is capable of performing against resistance.* A Poor muscle may be useful for joint stabilization.

The person with function greater than for group F is not listed, as he will have adequate use of most equipment. The spinal cord quadriplegic of group A who does not use balanced forearm orthoses or their equivalent should be treated as a "person without arm function," p. 115.

The following table is intended as a guide and should not be interpreted rigidly. Persons within each group may wish to test the equipment listed for the next higher or next lower group.

Equipment is tested in the normal order, i.e., equipment for conversation, switches, and dials. The choice will be influenced by the general factors outlined previously on pp. 58-66.

8.

The Final Choice of Telephone

As the testing of the patient proceds, it should be accompanied by discussion of the circumstances in which he will use a telephone. These general factors were described fully pp. 58-66, and the point to be covered with the patient are summarized below.

At home.

The evaluator should consider the layout of the house, to discover in which rooms and at what times the patient will use the telephone; the family routine, to see how these movements and the patient's needs through the day correspond with other members of the family. Could one telephone be moved from room to room or is more than one telephone desirable? Does the patient use the telephone sufficiently to warrent the expense of premium equipment? Will he be alone occasionally, can the telephone be placed where he can reach and operate it, and, for an incoming call, in sufficient time?

At place of work.

The evaluator should consider the location of the telephone on the patient's working area for economy of effort and space; the use by others of the same telephone; the need for private conversation; the use of extension and hold buttons; the operation of other switches for a tape recorder, summoning a secretary or another staff member; the cooperation of the employer.

It is helpful to bear in mind that the evaluator evaluates the patient's function, decides which telephones are relevant to his needs, and provides opportunity for the patient to compare one with another. He assists the patient in analyzing the background factors involved and for some pieces of equipment shows the patient how to develop skill in their use. But the final choice of which telephone is to be installed must be made by the patient and his family, or his employer.

9.

Assistive Equipment and its Significance for Use of the Telephone

WHEELCHAIRS

Wheelchair Arms

Desk arms on a wheelchair will allow the user to approach under any desk or table.

Straight arms usually have a height of 30″ and will not fit under an average height desk or table. The wheelchair user who for this reason has difficulty reaching a telephone placed on an ordinary desk or table may require one of special design or a telephone shelf that will project toward him.

Footrests

If the footrests obstruct the disabled person's approach to a wall telephone, he may have to approach the telephone diagonally or parallel to it. When the patient also has a loss of arm function, using a telephone from this position may not be possible and he may need a suitable surface on which to place a desk telephone.

Lapboard

The person using a lapboard for convenience would not necessarily find that it would bar his approach to a telephone. He might us it on occasion as a place on which to rest the telephone.

A raised lapboard has two implications: either the user will not be able to approach under the average height table and may need a special shelf on which to place the telephone, or the loss of muscle function that necessitates use of this raised lapboard can prevent the user from propelling his chair manually and reaching a telephone placed elsewhere than on top of the lapboard.

TYPES OF WHEELCHAIRS AND THE USE OF A TELEPHONE

"Standard" Wheelchairs

The term "standard wheelchair", as used in this text, refers to any wheelchair that may be propelled manually by the user.

Propelled by the User.

When the user has good trunk balance and adequate use of his arms, he may reach either to the front or over the sides of the wheelchair to a telephone placed on a table or wall. If he is unable to reach a wall telephone from a frontal approach, he should approach diagonally, so the arm he will use is on the side away from the telephone (see Fig. 41, p. 137). If this diagonal approach is not possible, one parallel to the wall may be effective. From these positions he can reach across his body to use the telephone. For the person with impaired arm function, using this opposite arm is usually necessary to permit grasping the handset and operating the dial.

The person unable to reach out from the chair may need a projecting shelf for the telephone, so that he can make a frontal approach to it.

The user who cannot propel his chair.

When the disabled person is unable to propel himself, it will be necessary for another person to place the telephone equipment in position for his use, probably on his lapboard. When he wishes to use a telephone in different rooms, wall jacks could be installed to allow its transfer.

Normally, 4A key equipment has to be located in one place due to the wall mounting of the equipment box. When it is more convenient for the disabled person to have this equipment in more than one location, the equipment box could be secured to a board and the other units placed on it. The board could then be brought to the disabled person as necessary.

When a Speakerphone is used and the patient would like to carry it with him, the transmitter unit can have a long cord (by special arrangement) to allow it to be placed on his lapboard.

When a call comes for the disabled person, it may not always be convenient for others to bring the telephone to him or to move him to its location. Taking a call over the regular telephone will require another person to hold the handset to the patient's ear when he is unable to do so. When his chair incorporates openings for a hook-on headrest, a specially constructed device for holding the handset may be inserted as needed (see p. 37).

The more severely disabled person may have to depend on others for his transfer from bed to wheelchair, and the time at which this is done may depend on the convenience of the family. In this case, it will be helpful to know when the patient will be in bed, when he will be in the chair, in which rooms he will be, and how these arrangements fit into the routine of the family. Information on the use of the telephone by the entire household will be helpful in planning the most appropriate telephone installation for them.

The severely disabled person's ability to use a telephone independently can provide greater freedom for him and for his family, by making it possible for him to be left alone in the house occasionally. The family would be able to call him while they were away, and he could place a call if any emergency arose. This may not be possible or desirable for all severely disabled persons, but in those cases where such independence is important to the patient and his family, every effort should be made to devise a suitable method.

Reclining Back Wheelchairs

The user of a reclining back wheelchair may wish to use a telephone only when sitting upright, or he may wish to use it both when sitting and reclining. Unless his use of the telephone is extensive enough to warrant two telephones, the unit chosen should be sufficiently versatile to be used in both positions.

When a handset mounted by the patient's ear is considered suitable, or when a switch needs to be placed by the head of the person without arm function, the openings in the tubular frame of a reclining back wheelchair used for the hook-on headrest provide a convenient place for the insertion of handset-holding equipment (such as a gooseneck arm, see p. 37), or a mounting for a switch (see Fig. 33, p. 117). These openings cannot be used when the user reclines, however, since the headrest would then be placed in them. Nor can they be used when his neck is weak and he needs the constant support of the headrest. In these cases, securing the switch, or handset-holding arm, to the wheelchair by a clamp can be considered. A suitable one is the "standard chair bracket for overhead rod" normally used for the overhead rod of an arm suspension sling. A source for this is Jaeco Orthopedic Specialties, Box 616M, Route 5, Hot Springs, Arkansas 71919.

Either of these methods of attaching a handset-holding arm to the wheelchair will necessitate modifying the lower end of the arm.

Motorized Wheelchairs

The points already outlined for the very severely disabled person in a standard wheelchair or a reclining back wheelchair may be appropriate to the user of a motorized wheelchair, with one significant difference: the user is able to move himself to a telephone. Because he will be incapable of moving his arms over more than a small area, considerable ingenuity may be required to find a telephone that this disabled person is able to use independently.

A Speakerphone is an excellent choice, particularly when the patient has a desk under which he can drive and over which he can reach with his arms (see Figs. 3 and 4, pp. 63, 64). When he cannot reach the Speakerphone on a desk, a separate switch (e.g. 6017-type key), placed where it can be operated after propelling the chair toward it, would allow him to take incoming calls easily. Alternatively, the transmitter buttons may be operated by using a paddle-lever device when this provides a sufficient projection for the patient to reach. To make an outgoing call by dialing independently may be more difficult to arrange unless Touch-Tone calling is available. In such cases, locating a separately housed Touch-Tone dial in a projecting position may allow the patient to dial. This positioning would also apply to 4A key equipment, although providing for conversation would be more difficult than when using the Speakerphone. A gooseneck arm could be used for the handset, placed where the patient could drive up to it.

A special arrangement for the person who can move only his head and neck utilizes the Trimline set (Fig. 37, p. 121). The Touch-tone dial handset is mounted on a projecting rod and calls are connected and disconnected by microswitch.

ASSISTIVE EQUIPMENT FOR THE UPPER EXTREMITY

Balanced Forearm Orthosis

When muscle weakness about the elbow and shoulder prevents a disabled person from bringing his hand to his mouth, a balanced forearm orthosis (previous terminology—"feeder") may be employed. It is a balancing device which may be attached to the wheelchair and onto which the forearm is rested.

A balanced forearm orthosis (BFO) consists of an assembly of freely moveable parts, composed of rods and ball bearing joints, attached at one end to the wheelchair frame and at the other to a forearm trough. The connecting rods allow horizontal movement of the arm, and a pivot centered under the forearm trough allows the hand to move vertically. The balance of each component is delicately adjusted to utilize all the force the person is capable of exerting. Several types are in existence, Fig. 3, p. 63 illustrates one commonly used.

Whichever mechanism is used, a BFO operates by supporting and positioning the arm and employing the advantage of counterbalance. In this way, the effects of gravity and resistance on movement are reduced, and through redistributing the weight, a minimum of power can produce the desired movement. However, the delicately balanced system cannot accommodate more than a small amount of additional weight or force. Operations such as lifting a handset or using the hand to apply pressure may not be feasible.

Telephoning.

Frequently, the person who requires these orthoses cannot lift a standard handset, nor can he lift a Wear-it-or-Hold-it set completely up to his ear. However, he may be able to use the lighter-weight set when he can bring his head down to meet it.

Downward pressures may be more difficult to exert than horizontal pushing and pulling. Therefore, lever switches will be preferred to standard pushbuttons. The rotary dial may be easier for some people to use than the Touch-Tone dial.

A low height for telephone equipment may allow force to be exerted most effectively; thus a separately housed dial may be preferred (see Fig. 11, p. 87).

The person with a flail hand and wrist may wear an ADL long opponens orthosis or rest the palm of his hand on a support extending from underneath the forearm trough of the BFO. By means of a detachable spring-clip (see Fig. 20, p. 98), the orthosis or the support will receive attachments such as a pen, dialer, or typing stick. The typing stick may be used for moving levers or pressing buttons, or a dialing tool may be substituted for use with a rotary dial. The length of a dialer must be appropriate to the person's needs, and dowel rods of different lengths may be attached to the short "ball" dialer until the correct length is found. When the diameter of the rod is smaller than the tube of the spring clip, the rod may be wrapped with masking tape to achieve the necessary diameter. If the patient proves able to use this dialer, a permanent one may be made for him from a dowel rod of the appropriate size.

and dowel rods of different lengths may be attached to the short "ball" dialer until the correct length is found. When the diameter of the rod is smaller than the tube of the spring clip, the rod may be wrapped with masking tape to achieve the necessary diameter. If the patient proves able to use this dialer, a permanent one may be made for him from a dowel rod of the appropriate size.

Overhead Suspension Sling Support

Overhead suspension sling support provides assistance similar to that of balanced forearm orthosis, and the same considerations apply for using a telephone. In some cases, however, muscle strength at the elbow and in the hand may be adequate to use a handset and dial. This will be revealed by the evaluation procedure.

Elbow Flexion Orthosis

When weakness at the elbow prevents the ambulatory disabled person from voluntarily flexing his elbow, this jointed appliance may be used. The power for flexion is transmitted by a cable from movement of the opposite arm or the leg, or from an external source such as a battery or CO_2 power supply. Extension of the elbow occurs from the force of gravity acting on the weight of the forearm. The elbow may be locked in this position when the orthosis incorporates a locking mechanism.

Telephoning.

The person wearing an elbow flexion orthosis will not have sufficient strength at the elbow to lift the weight of a handset up to his ear. He will flex his elbow first and then grasp the handset—a movement that may require him to lean forward—and afterward prop his elbow on the desk or table to keep the handset by the ear. "Hands-free" equipment would be more suitable for the person who uses the telephone a great deal or who has occasion to take notes.

Pressing buttons may be difficult unless the disabled person has the ability to extend his elbow, or has an elbow lock on the appliance to provide the necessary rigidity. Lever switches may be preferred. His ability to dial may be impaired.

Wrist and Hand Orthoses

The following representative orthoses have features that have significance during the use of the telephone.

Basic Opponens Orthosis

When the C-bar projects along the flexor surface of the thumb, it may interfere with use of a handset. The metal or plastic material may not provide sufficient friction against the plastic of the handset handle to allow a secure grip. When the orthosis cannot be modified, the use of some type of friction tape on one side of the handset handle may be helpful.

ADL Long Opponens Orthosis

A dialing tool may be placed in the pocket on the metacarpal bar to protrude from the ulnar side of the hand or, occasionally, from the thumb side (see p. 97). But when a dialer across the palm does not allow the patient to make contact with the dial hole, it may be necessary to use his spring clip so that the dialer (or a typing stick) points down and along the line of his fingers (see p. 97). When the patient cannot insert and remove a dialer without assistance, the sequence of operations he employs in using the telephone (see p. 61) should be analyzed to insure as much independence as possible.

The patient who has adequate motion in his shoulder and elbow may be able to use a handset despite a complete loss of wrist and hand function. This will depend upon the position of his fingers and whether there is any tightness in flexion. Flail fingers may necessitate a "hands-free" telephone, but when the patient's fingers are slightly contracted, the possibility of his using a Wear-it-or-Hold-it handset should be considered (see Fig. 7, p. 71).

Tenodesis or Wrist Driven Prehension Orthosis

These types of orthoses are used to transform movement at the wrist into a three-point grasp between the first two fingers and thumb. When there is also a complete loss of function at the wrist and hand, the wrist joint is stabilized and an external source of power may be connected to the linkage to open and close the fingers (see Fig. 33d, p. 117).

Telephoning.

The manner in which the fingers and thumb meet together to grasp an object has bearing on the use of the telephone. The thumb is stationary; as the wrist is extended, the first two fingers close down as a unit against the thumb. As the wrist flexes, these fingers are moved away from the thumb and the grasp is opened.

The two fingers together are too wide to be used for pressing one button of a group, as on the Touch-Tone dial, and the thumb may be used instead. As this protrudes only when the wrist has been flexed (when the wrist is extended, the thumb is against the fingers), the Touch-Tone dial may be used when it is turned sideways to avoid obstruction to the fingers from the cradle posts (see Fig. 13c, d, p. 91).

A dialer held with this type of grasp can point only in one direction—that which has resulted from its most secure anchorage following extension of the wrist. No further movement can take place at the wrist without the dialer being released. Therefore, any alteration in the angle between dial and dialer to permit the most efficient utilization of force must come from respositioning the dial (see " Positioning the Rotary Dial," p. 103).

A dialer tends to be dislodged from the hand during rotary dialing, and it is preferable that a projection from the orthosis be use in the hole of the dial finger-wheel (see Fig. 17d, p. 95). When this is not possible, padding the dialer may allow a more secure grasp.

SELF-HELP DEVICES

Only a few devices are involved in use of the telephone. The most notable of these are the dialing tools and universal cuff, described fully on pp. 44-47.

Writing Cuff

When a writing cuff is used to take notes during telephone conversations, the sequence of operations the patient follows should be checked (p. 61).

Mouthstick

The long mouthstick used by the person with function only at the neck may be used for depressing buttons (including the use of a Touch-Tone dial), and for moving levers. A mouthstick should not be used on a rotary dial unless it is shorter than 8 to 10 inches in length, as the force exerted on the teeth would be excessive. (Therefore, operating a rotary dial by mouthstick can usually only be accomplished by the person with good trunk motion—who is able to hold a pencil in his mouth and lean forward to dial.)

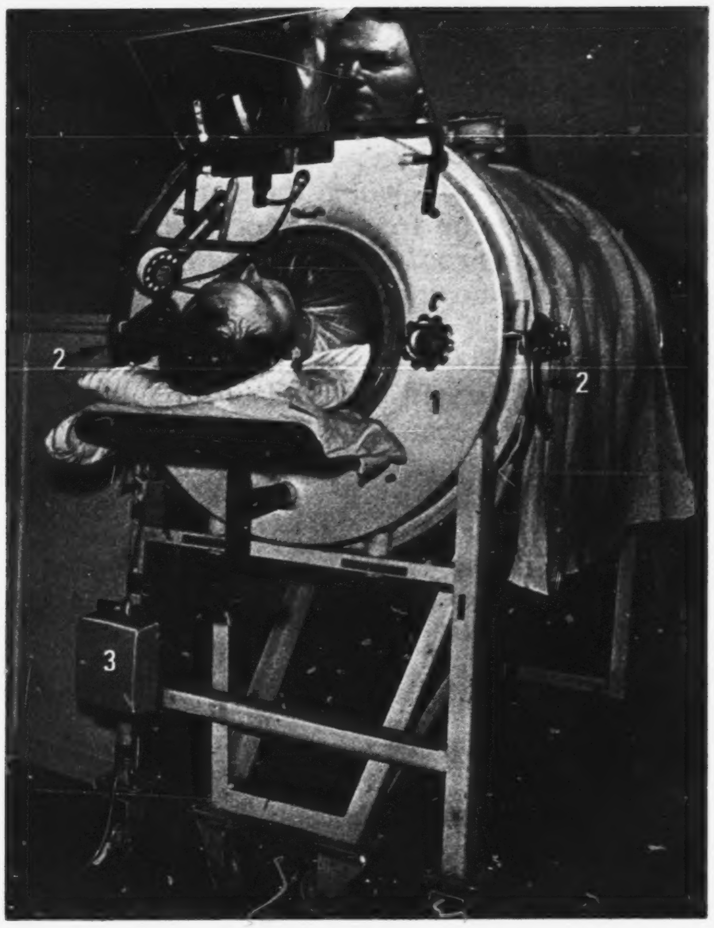
The transmitter end of a handset on a gooseneck arm may obstruct the patient's use of a mouthstick. If a separately mounted transmitter cannot be provided (see Fig. 39), a lightweight headset or Speakerphone may be necessary.

Switches should be as effortless as possible in operation; in some cases a lever may be preferred to pushbuttons.

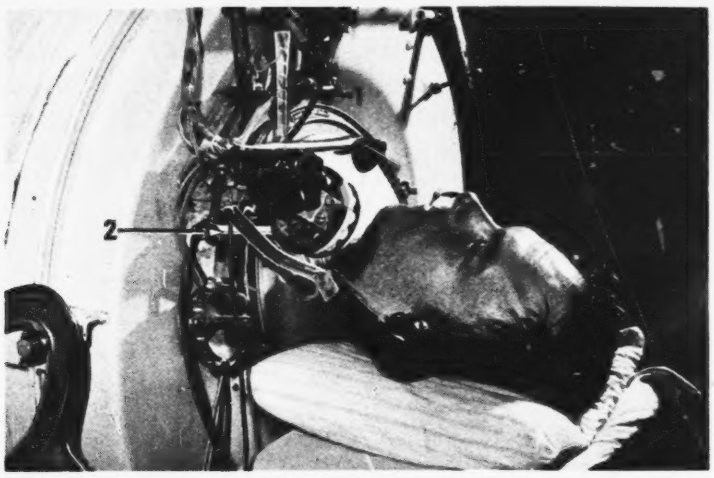
EQUIPMENT FOR RESPIRATION

Rocking Bed

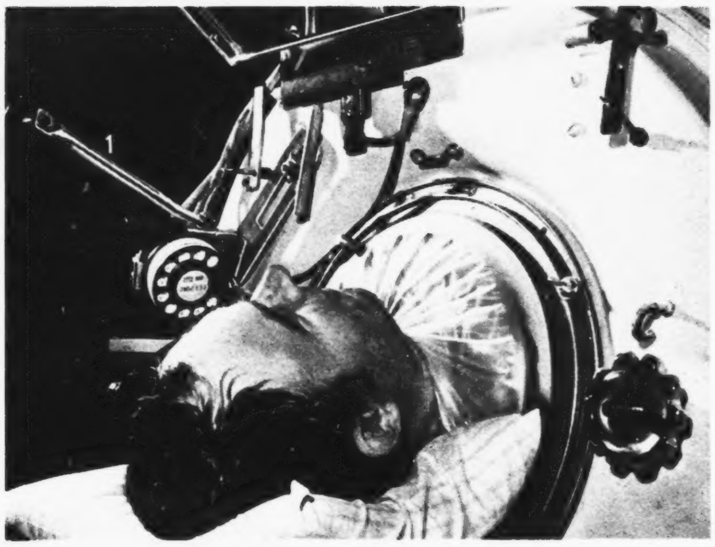
A rocking bed requires special consideration only when the disabled person wishes to be able to use the telephone while rocking. When he can use a desk telephone, it may be placed safely at the center of the bed next to his hips. When "hands-free" equipment is necessary, a Speakerphone or headset with long cord may be used (by special ar-



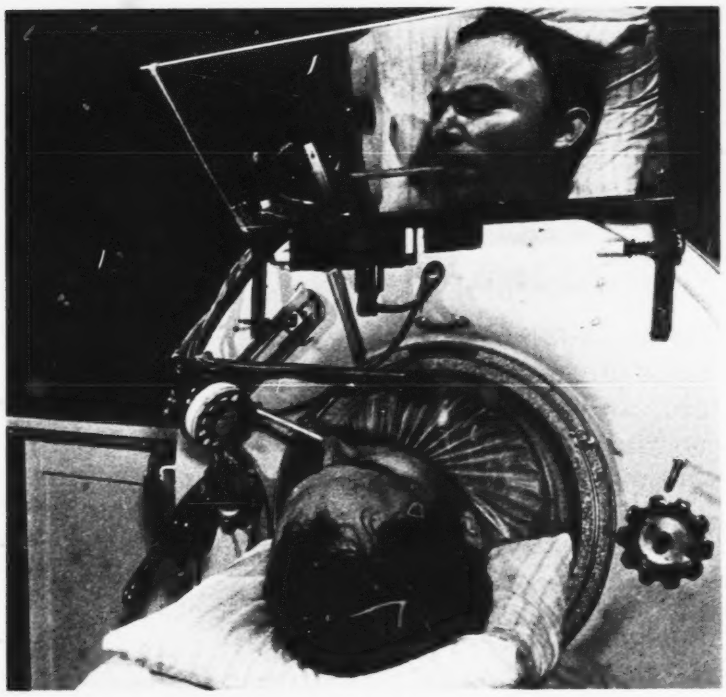
39a



39b



39c



39d

FIGURE 39

Modified 4A key equipment for use in a tank respirator.

The person able to turn his head only to one side cannot use a handset positioned by his head because it will obstruct the use of a mouthstick.
The Wear-it-or-Hold-it set has been disassembled. The receiver is by Mr. D. P.'s ear and the transmitter has been mounted on a swivel arm so it can be swung out of the way during meals or while Mr. D.P. is moved from the tank respirator. A special amplifier was employed to raise the level of received speech so Mr. D.P. does not have to keep his ear against the receiver.
A mouthstick rests in position for use and Mr. D.P. uses it to operate the lever switch and to dial. The mounting cord is plug-ended and jacks have been provided in several locations so telephone service is available when the tank is rolled from one room to another.
(39a) A tank respirator. The bed on which Mr. D.P. lies is attached to the faceplate (1). When he is moved out of the respirator, the clamps (2) are released and the bed and faceplate are wheeled away from the tank. The 4A key equipment box (3) is attached to a leg of the respirator faceplate.
(39b) The modified lever (1) of 4A key equipment is 4 inches long and flat to allow good contact by the mouthstick (2), seen lodging in its easily reached resting place.
(39c) The transmitter arm (1) swivels away when not required.
(39d) Using the mouthstick to dial. As this installation was made prior to the development of the 9-type dial, a 6-type dial was used. The sliding mounting for the dial (1) permits adjustment of its position to correspond with the arc through which Mr. D.P. can move the mouthstick.

rangement). When a gooseneck arm is chosen, it may be clamped to the mattress frame. Before considering any equipment that must remain close to the patient, particularly a head-operated microswitch, the distance he slides from position during rocking should be observed to make certain that such equipment can be used.

Tank Respirator

Equipment may be secured either to the faceplate or headrest (provided it would not interfere with access to the user in an emergency), or to a stand or wheeled cart which may be brought to the patient as desired. The use of portable equipment will be helpful if the patient spends time away from the respirator and needs a telephone that could be used from more than one position.

Equipment for Conversation.

A lightweight headset is an excellent choice. A Speakerphone may be placed nearby. A Wear-it-or-Hold-it handset (on gooseneck arm) may be used, provided that the transmitter end does not interfere with the use of a mouthstick. It may be preferable to provide a separately mounted transmitter and to attach it to the faceplate. The one illustrated in Fig. 39 swivels to allow access to the patient.

Switches.

A separate switch will be necessary. The key of 4A key equipment may be placed nearby for mouthstick operation, or a microswitch may be used. The switch may be secured to the pillow or headrest and operated by turning the head, or it may be secured to the faceplate for mouthstick operation.

When a Speakerphone is used, the transmitter may be placed nearby and a separate switch provided; or an attempt could be made to provide a holder on the faceplate into which the transmitter could be placed for the buttons to be operated by mouthstick. A volume-control wheel and enlarged button tops will be necessary.

Dials.

A separately housed Touch-Tone dial attached to the faceplate can be operated by mouthstick when the disabled person is able to reach over its area. The operation of a rotary dial by mouthstick would depend on the patient's strength. If neither is possible, and the person wishes to be able to telephone independently, manual service will be necessary.

Chest Shell

A telephone is chosen according to the patient's physical function. If the patient's physician approves, the chest shell may provide a platform for the attachment of a chin-operated switch.

Positive Pressure Equipment

Either a Speakerphone or a lightweight headset is excellent as equipment for conversation (see Fig. 34, p. 119). A Wear-it-or-Hold-it set on a gooseneck arm will prove suitable if the transmitter end does not obstruct the use of a mouthstick. A separately mounted transmitter and receiver may be preferable.

10.

Special Facilities or Services for Summoning Assistance

Severely disabled individuals are sometimes obliged to remain unattended for varying periods of time. Friends, relatives, companions or attendants cannot always be on duty around the clock. Thus there is a need for arrangements to enable the unattended disabled person to summon assistance in an emergency.

If the handicapped person is able to make outgoing calls, he can call a friend or neighbor, or the police or fire department, in an emergency. If he is unable to manage numbers, or fears he will not be capable of dialing seven digits, he might use a Card Dialer telephone. It could be left with an appropriate card pushed down into the slot, so that all he would have to do would be to lift the handset for dial tone and depress the "start" bar. The card could contain the number of the police department, an answering service, or simply "0" for "operator."

Obviously, if the handicapped person had manual service, he would only have to operate the switch to connect him with the operator. Another method of placing a call is by a one-number dialer (a special assembly, not a standard equipment item). This device, when activated by a switch, would dial a predetermined number where 24-hour coverage was available, such as a telephone answering service. The answering service operator would be provided with a list of people to be notified and numbers to be called in emergencies of various types. Alternatively, the one-number dialer could be arranged to dial "0" for "operator."

A versatile device for automatically summoning assistance is the Alarm Reporting Telephone (ART). The user triggers it by pushing a button, operating a switch, interrupting a light beam, or closing an electrical circuit in any other way he may choose. The ART is available from the telephone company and the triggering arrangement is furnished by the disabled person. The ART switches on, waits for dial tone, and dials a predetermined number. Then it gives a message that has been recorded earlier. If the called number is busy or does not answer, the ART automatically redials and tries again until the message is acknowledged.

A disabled person living alone may fear that he could not reach the telephone or a switch if he fell or became ill. For this situation, some telephone answering services offer a "reassurance service." An answering service operator telephones the shut-in at agreed-upon intervals (e.g., daily, twice daily, hourly). If no answer is received, the answering service operator has instructions to notify someone to make an investigation.

It is sometimes possible, on a special assembly basis, to arrange a Speakerphone installation so that it switches on automatically when there is an incoming call. Thus the handicapped person has no need even to press a button to answer. When the words "Are you all right?" come out of the loudspeaker, all he has to do is to answer, "Yes." If he fails to reply, the caller can summon assistance.

11.

The Use of the Telephone for a Business at Home

The person so severely disabled that he is limited to working at home has few vocational opportunities open to him. One area of work in which physical condition makes little difference is that involving use of the telephone. Some services offered over the telephone will require the ability to record transactions.

Arranging group meetings can take a great deal of the organizer's time and assistance from another person may be welcomed. For clubs, civic organizations, churches, conventions, political organizations and reunions, the disabled person could schedule and plan meetings, make the necessary reservations, or call to remind members of the time of the meeting. Another area of arranging meetings would be to organize home demonstrations for manufacturers of cosmetics, housewares, etc.

Research can be done by telepone, such as TV & advertiser's surveys, market research, opinion polls.

Some disabled people have considered that having a telephone answering service will allow them to work at home. A service where the disabled person answers one or two other phones—such as in taking doctor's calls—can be established easily by the provision of an "off-premises extension," provided that the telephones are geographically located to allow this. Equipment for an answering service that handles many calls, however, is expensive and may prove impracticable for the disabled person to manage. Further information may be obtained from the Marketing Coordinator.

A simpler way in which a telephone may be used is in operating a message center. Some examples are: taking messages for salesmen who come in and out of town; taking calls for those without full-time help—for plumbers, electricians, contractors, real estate agents, ministers, etc.; taking orders for out-of-town businesses for products advertised in local papers; running a baby-sitting service; running a pet-sitting service; organizing a Nurse's Registry.

Unsolicited selling over the telephone is not well accepted by the average householder and it is recommended that any selling by telephone be done on a business-to-business basis only. Examples of this are selling advertising for calendars and programs on behalf of a local printer, or soliciting advertising from local merchants for the community newspaper.

The disabled person could make inquiries from the small business firms in his area to find out how he could be helpful to them by using his telephone from his home. A list of the types of work that could be performed is given below. Blank spaces have been left for the evaluator's notes on information relevant to his locality.

The Telephone Company has brochures on most of the subjects listed. These contain suggestions for the most effective way to use the telephone, and a discussion on the personal qualifications that are desirable—such as a pleasant manner—for anyone considering using the telephone as a means of employment. The brochures are available on request to the local telephone office.

Attracting accounts.

Reviving inactive accounts.

Collecting overdue accounts.

Marginal accounts.

Qualifying prospects.

Insurance renewals.

Magazine renewals.

Repeat sales.

Screening mail inquiries.

Answering letters.

Customer service.

Making appointments.

Arranging group meetings.

Skip tracing.

Credit management.

Wake-up, reminder, and reassurance service.

Telephone answering service.

Research.

Coordinating production.

Coordinating distribution.

12.

Coin Telephones for the Wheelchair User In Hospitals and Institutions

Many disabled people would be able to use a standard coin telephone if it were placed at a suitable height and if provision were made for easy access.

A new model of coin telephone is under consideration by the Bell System, but until one suited to the handicapped is available, the installation of existing models can be carried out in such a way as to provide the least impediment to their use.

The suggestions for placement away from the wall, and the possibility of using a separate switch and headset, are feasible only when the telephone is in a location reasonably protected from vandalism.

Types of Coin Telephone

Many types of coin telephone are available, the most common being the type where the coin is inserted flat, such as the series 100 and 200. A recommended model is 1A1 or its equivalent, however, since all its features are easier to use than those of series 100 and 200 (Fig. 40).

Change of Installation

When possible, the 1A1 or equivalent should be installed and mounted as described later. If the existing installation must be retained, its usefulness will be increased if it can be mounted suitably. If this is not possible, the length of the handset cord *must* be checked to see if it will reach far enough for the person in a wheelchair to use it. The standard length is too short and a longer cord should be installed. The handset should be a G3 type.

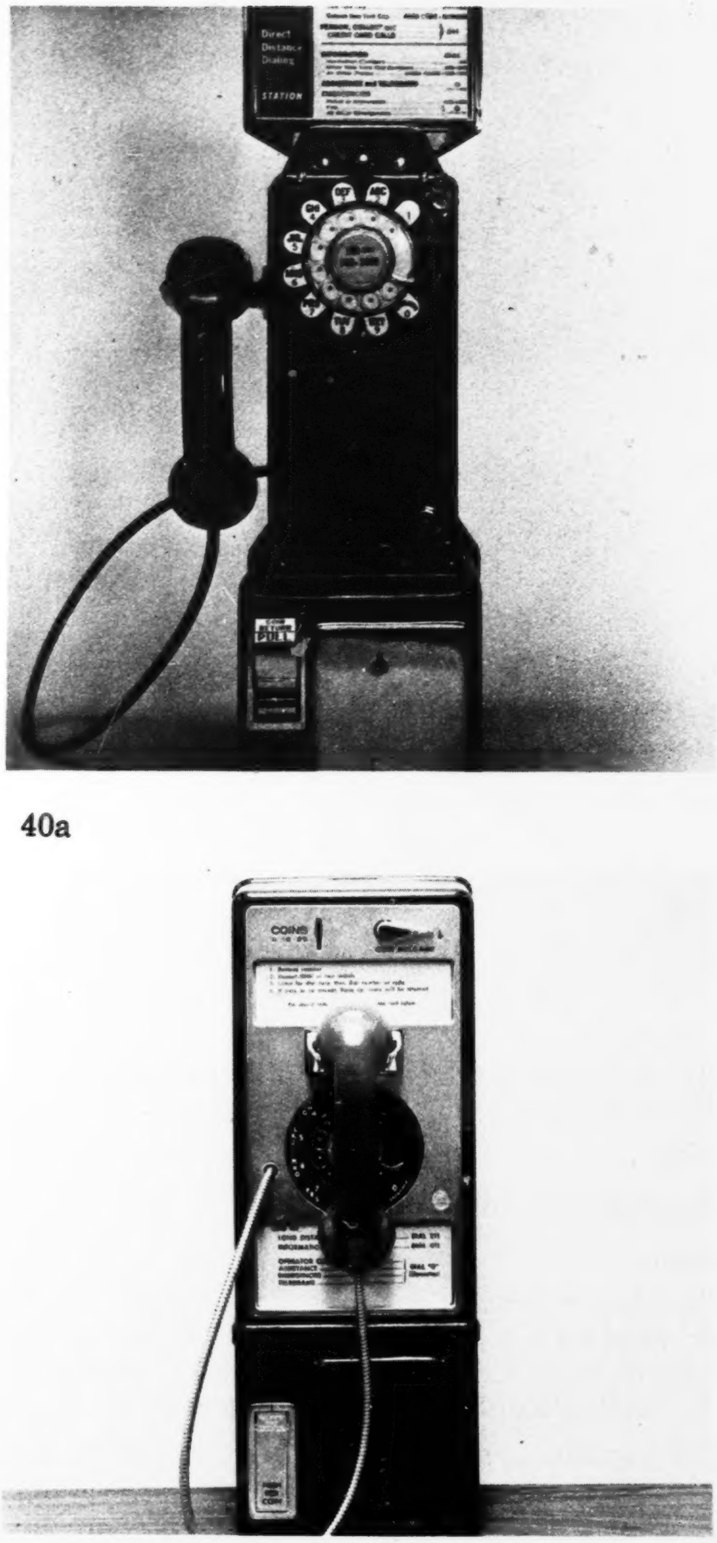
Installation as an Open Booth

Width.

The ideal mounting requires a total width of 56 inches of wall or open booth space. The telephone must be mounted in the center of this space and the booth should be acoustically treated.

The minimum width is 46 inches. This measurement is calculated from observations in the study as being sufficient to allow some wheelchair patients with loss of hand function the opportunity to use the coin slot by approaching it diagonally. When the wrist and fingers are used as a unit for holding the coin, the coin will project at an angle from the forearm axis. In order to place the coin in the slot, the *arm* must be appropriately angled to the face of the telephone, and therefore the user and wheelchair must be to one side (Fig. 41). However, a greater number of persons with loss of hand and arm function will be enabled to use the telephone when a 56-inch width is provided.

The very severely disabled patient will need an assistant to put in the coin and dial for him. The space that an assistant must have in order to stand at the side of the wheelchair should be considered when planning this type of installation.



40a

40b

FIGURE 40

Coin Telephones—200 Series and 1A1.

(40a) Series 200: The coins are inserted flat. The dial is the 6-type and hard to turn. The coin return requires the use of both hands and good finger function. The handset hanger is at the side and is movable; the handset must be lifted 1⅛ inches in removing it.

(40b) Model 1A1: A coin is inserted by edge and will roll into the slot. The 8-type dial is easily moved. A coin may be retrieved by the use of one finger. The handset is centrally located, making it easy to reach. Because it rests on a rigid hanger, the handset needs to be lifted only ½ inch to remove it.

Depth.

When a wheelchair is moved toward a telephone mounted directly onto the wall, the projecting footrests will prevent a near approach. Only those persons who can lean forward and who have good use of their arms will be able to use the telephone.

A wheelchair user can reach a coin telephone most easily when it is mounted on a projecting shelf. A false wall beginning at the height of the shelf will allow the telephone to be mounted forward, leaving the room for wheelchair footrests under it. When all patients using the telephone have the footrests of wheelchairs down in the normal position, the depth from the front of the telephone to the rear of the wall underneath should be at least 16 inches. If, however, it will be used by patients with their footrests elevated, this distance should be greater.

Height.

The telephone mounted on a shelf allows the wheelchair user to pull under it. The shelf should be as thin as possible and wide enough to project from the face of the telephone 3 to 4 inches. The projection will enable the user to place money on it and to rest his elbow when reaching for the handset, and a thin shelf allows the telephone to be mounted as low as possible to assist those who have difficulty in reaching the coin slot. The distance from the lower surface of the shelf to the ground should be 30 inches in order to allow access to all standard wheelchairs. A greater height would be needed if patients use raised arm rests or lapboards. However, raising the shelf will require the coin slot to be raised for all wheelchair users, and an evaluation should be made by each institution of the types of patients and their needs to determine the best height for its population. Where several telephones are in use a proportion could be raised, with the others installed at the 30-inch height. When coin telephones are being installed for the use of children, lower heights will be needed.

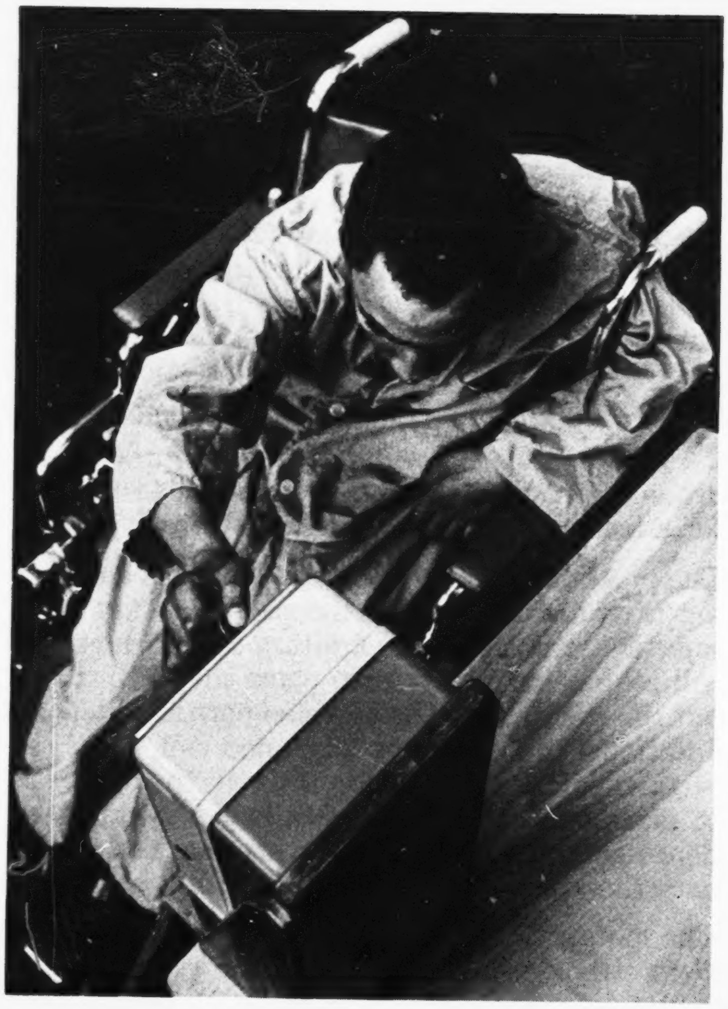
Installation on a Wall

The above specifications should apply in all cases. Where consideration of space forces the installation of a telephone on a corridor or room wall, it should never be placed in a corner or by an abutment. This position (and the use of a corner-mounted coin-telephone shelf shown in Fig. 42) will penalize the wheelchair patient who has poor use of only one arm. A clear space of 3 feet on either side will allow good access.

Noise is a serious problem that is encountered when a telephone is installed in a corridor, and for this reason an acoustically treated open booth is always preferable.

Impaired Hearing Handset

When several telephones are available for the use



41a

FIGURE 41

Approaching a wall-mounted telephone.

The foot pedals of a wheelchair will keep its user at a distance when approaching a wall from the front. Unless strength in his arms and trunk is sufficient to allow a person to lean forward, he must approach a telephone mounted on a wall from a diagonal or parallel position.

Attempting to use the arm nearest to the telephone results in an awkward and cramped position. For unhampered use of the hand, the outside arm should be used across the body.

The angle taken by the wheelchair to the wall is most important when using a coin telephone. (The model shown is 1A1.)

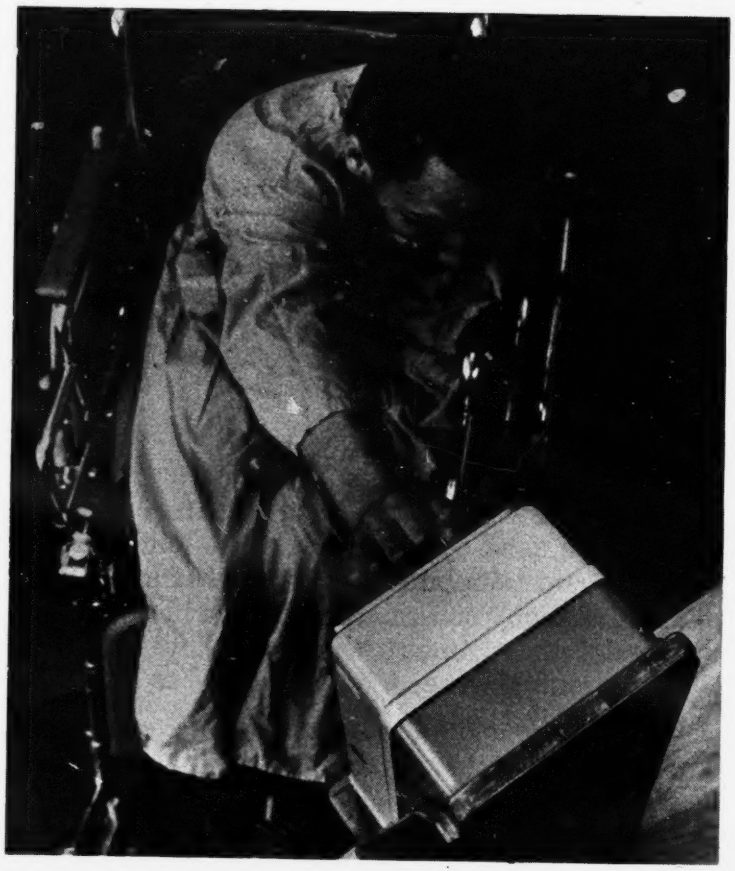
The person without finger function can hold a coin when he can extend his wrist to produce a tenodesis grip.

The angle at which the coin is held in the hand cannot be altered without dropping the coin. As the coin must align with the slot in order to roll into it—and the only way to accomplish this is by moving the whole arm—an accurate position of the wheelchair in relationship to the coin slot is a critical factor in successful insertion of a coin.

(41a) The wheelchair parallel to the "wall" does not provide the correct angle for the coin. The coin cannot be inserted.

(41b) When the wheelchair is positioned diagonally, the coin is at the correct angle for insertion.

(Spinal Cord Quadriplegic, Group E.)



41b

of the patients, at least one should have an impaired hearing handset.

Installation of Directories

These should be low enough and of the type where the books lie flat and only need opening to be used.

Techniques of Using a Coin Telephone

Wheelchair Approach.

In general, the patient in a wheelchair unable to approach the telephone head-on operates it best when approaching diagonally, with the arm to be used reaching across his body (Fig. 41). Attempting to use the near hand to manipulate handset, dial, and coin slot results in an awkward position, restricting the full use of the arm.

The position of the wheelchair is frequently dictated by the hand function of the person using the telephone. When his fingers are flexed and contracted, he may need to back his wheelchair diagonally to the wall so that his fingertip may be inserted in the hole of the dial finger-wheel. (With a Touch-Tone dial, he can make a straight approach if he is able to use a knuckle on the buttons.)

Inserting a Coin.

Model 1A1.

In this model, a coin is inserted on its edge and will roll into the slot.

The patient lacking finger and thumb function may hold the coin by a tenodesis grip. When he attempts to place it in the slot, the direction in which it points relative to the slot should be observed. When the patient cannot alter the coin's alignment in his hand, the position of the wheelchair should be changed.

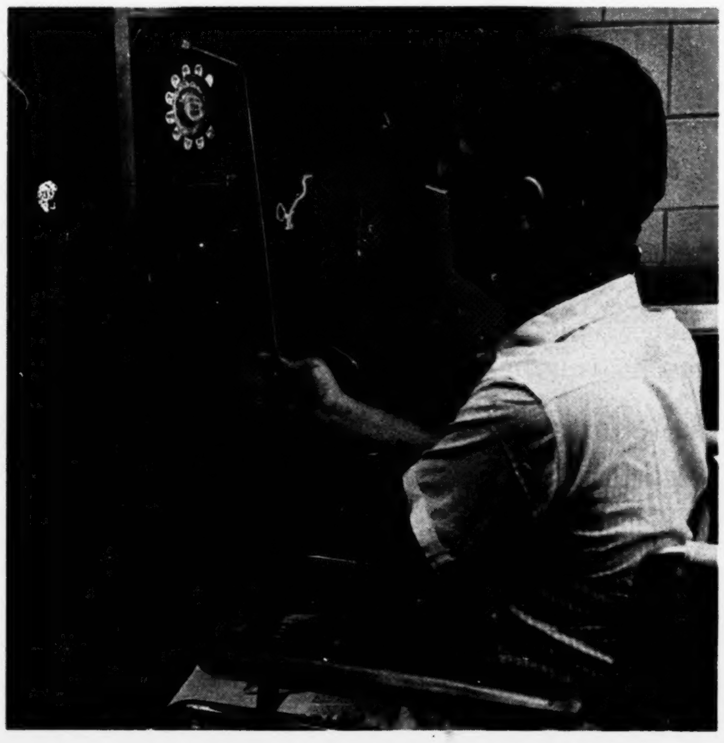
This type of slot allows the upper extremity amputee to use his terminal device for inserting coins.

Series 200.

A coin is inserted flat into one of the three coin slots until it reaches the back, and is then released to drop. The thumb is usually used to push the coin in place.

The patient lacking finger and thumb function may be able to place and hold a coin against the flat front of the coin slot with his thumb. He then slides the coin along until the hole is reached.

An upper extremity amputee cannot insert a coin with his prosthetic terminal device into this type of coin slot.



42

FIGURE 42

Use of a stick for inserting money.

The person unable to reach the coin slot with his hand may employ a lightweight angled stick. A piece of adhesive substance, such as "Hold-it," is placed on the end of the stick and the coin is pushed onto it. This will hold the coin until it is placed in the slot, when gentle leverage on the stick will release it.

(Muscular Dystrophy)

Coin and Dialing Sticks.

When the patient cannot reach the slot, a curved plastic or metal stick (Fig. 42) with an adhesive substance at the end can be used ("Hold it"—an adhesive rubbery substance available from stationery stores—is recommended). The coin is pushed into the "Hold it" and then placed against the dial slot. Gentle leverage on the stick will release the coin and allow it to drop into the slot.

Two such devices are illustrated on p. 56. They are only practicable when one coin is to be used for a local call or to reach the operator.

The plastic stick is useful when Touch-Tone calling is available or when the user does not have sufficient strength to use a rotary dial. This person will require an assistant to place the call for him but the stick allows the disabled person to deposit additional money for an extended call, or, if the original call has been made through the operator, to place another call. He recalls the operator by depressing the switchhook with the stick, then uses the stick to insert another coin.

The metal stick is useful for the person with sufficient strength in his arms to turn a rotary dial. It is very light in weight (1⅜ oz.) and slightly flexible. Flexibility is not desirable but while greater rigidity can be obtained by using a different material this would increase the weight of the device and thus present an even greater difficulty to the user.

Dialing.

Model 1A1 has the 8-type dial, which is significantly easier to use than the 6-type on series 200. Patients who cannot use their fingers to dial may hold a dialer or pencil. Threading the dialer through the fingers allows some grip, and holding the other hand over the closed fingers makes the grip more secure.

Headset and Switch

In institutions housing many severely disabled people, it is most helpful to have coin telephones that can be used by those unable to hold a handset. The coin telephone division of the local Telephone Company can install a headset and switch, by special arrangement, that will allow conversation without the need for someone to hold the handset for the patient.

The headsets available are either the operator's headset or the Wear-it-or-Hold-it set as headset. Both have disadvantages. Since the operator's headset requires several adjustments, an assistant who places it on another's head must learn how to adjust it. In a large institution, this may not be practicable. The Wear-it-or-Hold-it headset has only one simple adjustment, but is comparatively heavy and cannot be used in comfort for more than a brief conversation by anyone who cannot adjust its weight on his ear.

Headsets which cut out noise by covering both ears, which are easy to place on the head, and which have a simple adjustment for positioning the transmitter, may be provided by the Telephone Company through special arrangements.

In the study, a gooseneck arm holding the Wear-it-or-Hold-it handset attached near the telephone has been considered as a possibility for use by those unable to hold a handset, but no test of its feasibility has been made.

Appendix A

THE DIAGNOSTIC AND DISABILITY CATEGORIES OF THE 305 PATIENTS EVALUATED DURING THE STUDY

- The Aging—General Problems, 12
- Amputation of the Upper Extremity, 18
  - (congenital anomalies, 2
  - shoulder disarticulation, 2
  - bilateral shoulder disarticulation, 1
  - above-elbow, 3
  - bilateral above-below, 2
  - above-elbow, below-elbow, 1
  - below-elbow, 7)
- Amyotrophic Lateral Sclerosis, 3
- Cerebral Palsy—Spastic, 8
- Cerebral Palsy—Athetoid, 10
- Fredrich's Ataxia, 2
- Guillain-Barre Syndrome, 2
- Hemiplegia, left, 33
- Hemiplegia, right, 33
- Multiple Sclerosis, 14
- Muscular Dystrophy, 15
- Parkinson's Disease, 16
- Perceptual Deficits, 5
- Poliomyelitis, 30
- Polymyositis, 1
- Polyneuropathy, 3
- Pulmonary Emphysema, 2
- Quadriplegia—traumatic spinal cord injury, 55
  - (Group A, 7
  - Group B, 9
  - Group C, 17
  - Group D, 8
  - Group E, 11
  - Group F, 2
  - Group G, 1)
- Quadriparesis, 13
  - (brain stem lesion, 3
  - traumatic brain damage, 10)
- Rheumatoid Arthritis, 29
- Syringomyelia, 1

TOTAL—305

Appendix B

FUNCTIONAL ANALYSIS OF USING THE HANDSET

The type of telephone available to the patient is largely determined by whether or not he can use a handset. A patient who can use a handset has the widest choice of telephones and the freedom to use those of others when he is away from his own installation.

The physically handicapped may have to use compensatory motions; each person will develop his own method according to his residual function. To determine whether it is feasible for him to manually use a handset,* account has to be taken of the residual function in both upper extremities, the ability to move the trunk, the ability to move the head to align it with the handset, plus the suitable choice of equipment.

A determination of the patient's capabilities is based upon two aspects of arm function; the ability to move his arm to place his hand by his head and the ability to maintain hold of the handset. Either may be impeded by changes in joint range of motion, insufficient muscle strength, or loss of coordination, alone, or in combination.

While the ingenuity of the 305 patients observed has demonstrated the inadequacy of measurement as a means of predicting ability, the following observations indicate the minimum residual function necessary to use a handset.

Change In Joint Range of Motion. Loss of range of motion in the joints of the arm, particularly loss of flexion at the elbow and loss of external rotation at the shoulder, may make it impossible for the patient to use a handset. The amount of loss, however, is of less significance than the position taken by the arm; ankylosis at the shoulder, elbow, and wrist are not in themselves a bar to lifting the handset and moving it to the ear when the action may be accomplished by scapular motion and forward bending of the trunk and neck. Joint laxity or loss of range of motion of the fingers do not necessarily prevent the patient from taking the handset off the cradle; the fingers and thumb may not be used at all when the handset can be lifted between both hands. Stiffness of the wrist which produces an unyielding joint may not be a handicap, whereas destruction of the ligamentous attachments resulting in an unstable joint may seriously affect function.

---

*The simple test used in the gross evaluation of functional motion is described on p. 69.

Loss of Muscle Strength. The study has shown so many variations in methods of compensation that sole reliance cannot be placed on the sum of residual muscle function.

The ability to forward flex and externally rotate at the shoulder and to flex the elbow are necessary to place the handset by the ear.

Holding the standard handset in the absence of functional finger flexors depends upon the patient's possessing the following minimum function at wrist or fingers:

Wrist extensors only: The patient with functional wrist extensors may have a tenodesis grip that enables him to grasp the handset. When tension in the flexor tendons of the fingers is not sufficient to allow such a grasp, the stability to the wrist afforded by the wrist extensors may still permit the patient to use the handset. He can hook his thumb under one end of the handset to raise it off the cradle, and by balancing it in the web of the thumb, bring the handset to the ear.

Wrist flexors (in the absence of power in the fingers) can be utilized in holding the handset when both hands can be used, one at either end of the handset. Another method may be employed when full supination is possible. The palm of this hand is moved under the receiver end until it is under the handle while the other hand stabilizes the handset by pressing on its top. Once the patient has lifted the handset, he will bring it to his chest, and sliding the handset against it, nudge it by stages to his ear. (Any method of reaching simultaneously with both arms can only be used by the person with adequate trunk balance.)

Fingers—long extensors. Either the handset may be pinched between two extended fingers or the fingers may be slipped under a strap around the handset handle (see Fig. 6, p. 68).

It should be noted that while motion at the wrist or fingers, or use of the thumb as a hook, will be necessary in order to hold a standard handset, using the Wear-it-or-Hold-it handset only requires stability at the wrist and tension in the finger flexors (see Fig. 7, p. 71). It does not require motion in the fingers or thumb.

Neuromuscular Incoordination

Ataxia

Ataxia will not prevent the patient from using a handset when both hands can be used to bring the handset to the ear. Using both hands may not be possible, however, when the patient has very poor trunk balance, or the ataxia is severe. Also, the patient who can bring the handset to the ear may not be able to maintain this position.

Athetosis

Severe athetoid movements usually will prevent the patient from using a handset. If he is able to place a shoulder rest in position, he may find it possible to use a handset.

Spasticity

A patient must be able to grasp and release the handset and to flex the elbow. In moving a standard handset to the ear, the spastic arm tends to flex at the wrist, pronate at the forearm, and abduct at the shoulder. From this position, a handset cannot be aligned with the ear and mouth. The patient who is able to forward flex the arm at the shoulder and who has minimal spasticity of the internal rotators, can usually use a handset. Assistance in supinating the forearm is gained by using the following method. Before the handset being raised nears the head the patient turns his head away. He presses the rim of the receiver behind his ear, so that by turning his head forward and horizontally adducting his arm, the headset can be brought into good position by his ear and mouth. The maneuver also eliminates the risk of the patient striking his face with the handset during its use. (The Wear-it-or-Hold-it handset may evoke less spasticity at the wrist than the standard handset, p. 29. The patient who is unable to maintain his hand in a position by the ear may benefit from use of a shoulder rest.)

Appendix C

FUNCTIONAL ANALYSIS OF USING A PARALYZED HAND IN ROTARY DIALING

Dialing exerts pressure around almost all of the circumference of an object used to dial (see Fig. 10, p. 76) and a paralyzed finger would buckle in attempting it unless a way were found to maintain its rigidity. Since pressures against the flexor or lateral surfaces are resisted by the ligaments of the interphalangeal and metacarpophalangeal joints, dialing may sometimes be accomplished despite loss of muscle power when the hand can be positioned to allow the substitution of these joint restraints. Some methods of dialing that are employed by seated patients with seriously paralyzed arms and hands are described below.

Index Finger

Power of Flexion or Extension

Aided by wrist movements, the patient who can flex and extend his finger accomplishes dialing by employing the movement of extension to three-quarters of the way around the dial, and then uses finger flexion to bring the dial finger-wheel to the stop. Good strength at the shoulder is not necessary, nor is the ability to flex at the elbow, other than the strength to move the hand onto the dial and maintain it in position.

Power only of Flexion

The arm has to be capable of placing and maintaining the finger in the hole of the dial finger-wheel, so that, while the dial is being moved, pressure against the hole can be maintained by the flexor or lateral aspect of the finger. For this, muscle strength at the shoulder must be at a functional level, flexion at the elbow, supination and pronation must be adequate, power to flex or extend the wrist is necessary, and there must be reasonable tightness at the anterior aspect of the wrist. Some of the techniques that can be used are described under *Flail Finger*.

Flail Finger

Dialing can be accomplished with the residual function described above, provided that the tension in the finger flexors or tightness at the metacarpophalangeal joint is sufficient to allow the finger to be used as a post.

The following methods may be used by the spinal cord quadriplegic whose residual muscle function includes pronation of a Poor level.

In use of the right hand, after the finger is placed in the dial hole at "0", and pulled around to approximately 7, the patient has immediately to change into abduction and internal rotation at the shoulder and full pronation of the forearm. This will place the flexor aspect of the finger into a position for continuing around to the stop by movement into external rotation and supination.

The left hand commences in pronation and is moved in internal rotation and abduction at the shoulder; its switch at 7 is into supination and external rotation at the shoulder; movement of the dial round to the stop follows from internal rotation and pronation (see Fig. 24, p. 101). A variant of this can occur for the initial movement; from a fully supinated position of the forearm, the finger is placed in the hole, the arm moved forward to straighten out the finger and to point it back toward the patient (see Fig. 23, p. 99). Pressure from internal rotation at the shoulder and some pronation of the forearm moves the dial to the 7 position, when the position of full supination and external rotation is resumed. Pronation and internal rotation bring the dial to the stop.

Power only of Extension

Dialing may be accomplished in a manner similar to that described for a flail finger, with some reversals to allow contact with the extensor rather than the flexor surface of the finger tip. If wrist flexors are present in addition to the extensors, then shoulder movements may be less important. (Finger extension that is below a functional level can prevent a finger being used on the vertical dial of a wall telephone, and it may be necessary to use a dialer instead.)

Other Fingers

The middle finger is longer than the index finger and more firmly supported at the metacarpophalangeal joint. Using the middle finger for dialing may be more successful than using the index finger when the metacarpophalangeal joint allows excessive ulnar deviation or, in the right hand, where a short index finger allows the other fingers to catch on the dial. Any finger may be used for dialing in which rigidity can be induced by a controlled muscle spasm or where voluntary movement is present.

Severe Contractures

Severe contractures of the fingers will prevent the finger tip being inserted in the hole of the dial finger-wheel. Unless a flexed proximal interphalangeal joint can be placed on the dial hole, or the thumb can be used, a dialer may be necessary. When the hand can be turned into full supination, the dorsal aspect of the proximal interphalangeal joint of the little finger can be used. Other methods include using a protuberant pisiform bone in the finger-hole, or pressure may be applied to the dial finger-wheel by the side of the hand (see Fig. 22, p. 99).

The Thumb

The dial is moved by placing the tip of the thumb in the dial hole, but when the tip is too large, the pad of the thumb may be placed flat over the hole.

Flail Thumb

In order for the thumb to be used, it must project sufficiently past the fingers, and to prevent flail fingers from catching on the dial, the wrist may be extended. In left-handed dialing, the fingers will then be in position to provide stability to the thumb by blocking it during pressure against the hand in the most difficult part of dialing, "uphill".

In right-handed use, two methods may be used to move the dial to half-way. Either the pad of the thumb may be placed flat on top of the hole and pressure from the arm will push the thumb tip-first from the "0" to halfway or, the tip of the thumb may be inserted and pressure exerted by the nail. This latter method will be helped to succeed if a tenodesis action (extending the thumb through extensor pollicis longus by flexing and ulnar deviating the wrist) can be produced, or when the thumb can be blocked by the flexed fingers. In both methods, moving the dial from its position halfway around to the stop is then accomplished by pressure from the arm pushing the pad of the thumb against the dial hole. When there is excessive range into extension at the joints of the thumb, the thumb tip may dislodge and dialing fail. A dialing tool will then be necessary.

Appendix D.

TELEPHONE EQUIPMENT FOR PATIENT EVALUATION.

The policy of the local Telephone Company regarding the provision of telephone equipment on consignment may be found by contacting the Marketing Coordinator of Services for the Handicapped. Some items—for example, the handset-holding arms—must be provided by the rehabilitation facility, and some items—for example, the paddle-lever device—should be constructed by them.

The physical facilities that are desirable for the area used for evaluating patients are discussed on p. 8.

Speakerphone

To provide the patient with an opportunity of fully testing a Speakerphone, an operational model is desirable. (See 6-button telephone, to follow.) When this is not possible, however, the patient's physical ability to use the Speakerphone may be tested by using only the transmitter.

The transmitter should have a volume-control wheel. The enlarged tops to the buttons should be removable—to allow the transmitter to be tested with a paddle-lever device.

Desk telephone with headset jack.

This set should have a 9-type rotary dial. ¾ in. and 1½ in. levers for the headset button should

	be available. This set may be used to simulate the operation of a two-line telephone, by removing the handset and adding a 2½ in. lever, if desired.
Wear-it-or-Hold-it headset-handset.	
Lightweight headset.	A pair of eyeglass frames, preferably with straight side pieces and without lenses should be available for testing by the patient who does not wear eyeglasses.
Operator's headset.	
6-button telephone (with square buttons)	This set should have a Touch-Tone dial, where available. This set can be used for testing the use of a hold-lever device. (The set will not be necessary if an office 6-button set, with square buttons, can be used and Touch-Tone dialing is not available. Alternatively, if an operational Speakerphone is to be used, its associated telephone could be a 6-button set, with a Touch-Tone dial, where available.)
Separately housed dials.	Rotary dial, 1008B. Touch-tone dial, 1025A3, where available.
6-button Card Dialer with headset jack.	Levers for the headset turnbutton should be available. The card slot may be painted a distinctive color. An extra faceplate with a card guide attached will allow the patient to test its use (the face plate may be inserted as required).
Dialing tools.	"Ball" dialers, one padded with sponge rubber. Short "ball" attachment, with dowel rods of 5-in., 5½-in., 6-in. length and of a diameter that will fit into a spring clip. "Grooved-knob" dialer. Universal cuffs, three sizes.
Sparr Telephone Arm	The 29-in. length is suggested.
Luxo Extension Arm	The 45-in. size is suggested.
Two G3 handsets and two shoulder rests.	It is most convenient to leave the shoulder rests attached to the handsets ready for right- or left-sided use. If additional handsets are not available, the shoulder rests could be attached to the handsets on other telephones when this will not interfere with their normal use.
Key of 4A key equipment, or 6017-type (locking) key.	A 2-in. extension lever should be available.

Appendix E

RATES FOR STANDARD TELEPHONE EQUIPMENT

To obtain the rates for telephone equipment, this sheet can be detached from the Monograph and sent to the Marketing Coordinator of Telephone Services for the Handicapped. After it is returned, it may be secured to a blank page at the end of the monograph. It should be noted that only the rates for standard equipment can be listed; the rates for special assemblies are set on an individual basis. *IMPORTANT:* The rates may be changed from time to time and it is important that the list be kept current by checking it occasionally with the Marketing Coordinator. Each change should be dated.

Special Billing Arrangements

Financial sponsorship for a disabled person's equipment may be obtained to cover its initial cost, but is rarely available to cover a recurring monthly charge. A special billing arrangement may be utilized in meeting this need.

"Gift telephone service" allows the monthly charge to be placed on a sponsoring party's telephone bill.

In some instances, the Telephone Company offers a "single payment option." This offers a single payment and no recurring monthly charge.

DATE:	NON-RECURRING CHARGE	MONTHLY CHARGE
DESK SET:		
Rotary dial (500)		
Touch-Tone dial (1500)		
TWO-LINE DESK SET (used with one line):		
Rotary dial (510)		
Touch-Tone (1510)		
6- BUTTON DESK SET (used with one line):		
Rotary dial		
(per additional button required)		
Touch-Tone dial		
(per additional button required)		
WALL SET:		
Rotary dial		
Touch-Tone dial		
TWO-LINE WALL SET (equipped with one line and the other position used as cut-off):		
Rotary dial		
Touch-Tone dial		
HANGING HAND SET:		
PRINCESS SET:		
Rotary dial		
Touch-Tone dial		
TRIMLINE SET:		
Rotary dial		
Touch-Tone dial		
SPEAKERPHONE:		
DESK SET WITH HEADSET JACK:		
Rotary dial (514)		
Touch-Tone dial (1514)		
6-BUTTON DESK SET WITH HEADSET JACK (used with one line):		
Rotary dial		
(per additional button required)		
Touch-Tone dial		
(per additional button required)		
4A KEY EQUIPMENT:		
Rotary dial		
Touch-Tone dial		
WEAR-IT-OR-HOLD-IT HEADSET (53-type):		
LIGHTWEIGHT HEADSET:		
OPERATOR'S HEADSET (52-type):		
OPERATOR'S HANDSET:		
IMPAIRED HEARING HANDSET:		
WEAK SPEECH HANDSET:		
BONE CONDUCTION RECEIVER:		
HEADSET AMPLIFIER (for switchboards):		
WATCH CASE RECEIVER:		
ELECTRONIC LARYNX:		
TELETYPEWRITER EXCHANGE SERVICE (TWX), 60 speed with page printer:		
TACTILE-VISUAL SET·		
CARD DIALER:		
CARD DIALER WITH HEADSET JACK:		
6-BUTTON CARD DIALER:		
6-BUTTON CARD DIALER WITH HEADSET JACK:		
MAGNETIC TAPE REPERTORY DIALER:		
ONE-NUMBER DIALER:		
AUTOMATIC ANSWERING SET:		
AUTOMATIC ANSWERING AND RECORDING SET:		
WALL JACK:		
MOUNTING CORDS:		
9-foot		
13-foot		
EXTRA-LENGTH HANDSET CORD:		

Acknowledgements

Grateful acknowledgements are made to the following individuals and departments for their invaluable assistance and advice.

To Gale M. Smith, Engineering Department, American Telephone & Telegraph Company, whose contributions and deep interest made the project possible; to Wally Miller, William McLeod, Charles Spears and A. D. McWhorter, of the Marketing Department, American Telephone & Telegraph Company, and to Dave Garrabrant of the New York Telephone Company.

To Martha E. Schnebly, O.T.R., Muriel E. Zimmerman, O.T.R., Sophia Karafotis, O.T.R., Phyllis L. Palsgrove, O.T.R. and the staff of the Department of Occupational Therapy; to Martha Taylor Sarno, M.A., Director, Speech Pathology Service; to H. Richard Lehneis, C.P.O. and Robert G. Wilson, M.A., Department of Orthotics; to Rosalind R. Zuger, M.A., Director, Placement Services; to Phillip Johnson, Medical Illustration Service; at the Institute of Rehabilitation Medicine, New York University Medical Center.

To Dorothy Pesznik, O.T.R. and the staff of the Department of Occupational Therapy, Goldwater Memorial Hospital.